

**Ohio Department of Transportation**  
**Eaton Outpost**  
DOT-200023

Conformed Set

PREPARED FOR:

**Ohio Department of Transportation**  
**and**  
**Ohio Facilities Construction Commission**

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**END OF DOCUMENT**



# Document 00 10 00 - Solicitation (General Contracting / Electronic Bid) State of Ohio Standard Requirements for Public Facility Construction

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Electronic bids will be received by:

Ohio Facilities Construction Commission  
<https://bidexpress.com>

for the following Project:

Project DOT-200023  
ODOT Eaton Outpost  
5656 US-127  
Eaton, Ohio 45320

in accordance with the Contract Documents prepared by:

Jerome M. Scott Architects, Inc.  
1020 Goodale Blvd., Columbus, Ohio 43202  
614.225.9535  
Dano Boyne  
dboyne@jeromescott-architects.com

In compliance with Section 153.08 of the Ohio Revised Code and Section 153:1-8-01 of the Ohio Administrative Code, Bids for this Project are being received, opened, and published through electronic means using the State's electronic bidding service.

To access this Project through the electronic bidding service, you must first register at <https://bidexpress.com> by clicking on the "REGISTER FOR FREE" button and following the instructions. In order to bid, you must create and enable a digital ID within the service. This process requires the submission of notarized paperwork and may take up to five business days to complete. There are no fees to register, create and enable a digital ID, or to download bid documents. There is a small expense on a monthly or per bid basis to submit a bid. The electronic bidding service offers customer support that may be reached at 888.352.2439 or via email at [support@bidexpress.com](mailto:support@bidexpress.com).

Bidders may submit requests for consideration of a proposed Substitution for a specified product, equipment, or service to the Architect/Engineer ("A/E") no later than 10 days prior to the bid opening. Additional products, equipment, and services may be accepted as approved Substitutions only by written Addendum.

From time to time, the Commission issues new editions of the "State of Ohio Standard Requirements for Public Facility Construction" and may issue interim changes. Bidders must submit Bids that comply with the version of the Standard Requirements included in the Contract Documents.

Prevailing Wage rates and Equal Employment Opportunity requirements are applicable to this Project.

This Project is subject to the State of Ohio's Encouraging Diversity, Growth, and Equity ("EDGE") Business Development Program. A Bidder is required to submit with its Bid and with its Bidder's Qualifications form, certain information about the certified EDGE Business Enterprise(s) participating on the Project with the Bidder. Refer to **Section 6.1.10** of the **Instructions to Bidders**.

The EDGE Participation Goal for the Project is **5.0 percent**.

The percentage is determined by the contracted value of goods, services, materials, and labor that are provided by EDGE-certified business(es). The participation is calculated on the total amount of each awarded contract. For more information about EDGE, contact the State of Ohio EDGE Certification Office at <http://das.ohio.gov/eod>, or at its physical location: 4200 Surface Road, Columbus, Ohio 43228-1395; or by telephone at (614) 466-8380.

The Bidder may be subject to a Pre-Award Affirmative Action Compliance Review in accordance with Section 123:2-5-01 of the Ohio Administrative Code including a review of the Bidder's employment records and an on-site review.

The Bidder must indicate on the electronic Bid Form, the locations where its services will be performed in the spaces provided or by attachment in accordance with the requirements of Executive Order 2019-12D related to providing services only within the United States. Failure to do so may cause the Bid to be rejected as non-responsive.

**DOMESTIC STEEL USE REQUIREMENTS AS SPECIFIED IN OHIO REVISED CODE SECTION 153.011 APPLY TO THIS PROJECT. COPIES OF OHIO REVISED CODE SECTION 153.011 CAN BE OBTAINED FROM ANY OF THE OFFICES OF THE OHIO FACILITIES CONSTRUCTION COMMISSION.**

Bidders are encouraged to be enrolled in and to be in good standing in a Drug-Free Safety Program (“DFSP”) approved by the Ohio Bureau of Workers' Compensation (“OBWC”) prior to submitting a Bid and provide, on the Electronic Bid Form with its Bid, certain information relative to their enrollment in such a program; and, if awarded a Contract, shall comply with other DFSP criteria described in **Section 1.6** of the **General Conditions**.

Electronic bids will be received for:

<u>Trade</u>	<u>Estimate</u>
<b>General Contract</b> .....	<b>\$ 2,400,000</b>
Alternate 1 .....	<b>\$ 27,000</b>
<i>Alternate 2</i> .....	<i>(- \$ 100,000)</i>
<i>Alternate 3</i> .....	<i>(- \$ 48,000)</i>

until **February 14, 2022, at 2:00 p.m.**, when all Bids will be electronically opened. Bid tabulations will be posted no later than 5:00 p.m. on the day Bids are opened.

There will be no pre-bid meeting.

The Contractor is responsible for scheduling the Project, coordinating the Subcontractors, and providing other services identified in the Contract Documents.

The Contract Documents may be downloaded as electronic PDF files from the State’s electronic bidding service at <https://bidexpress.com> at no charge.

**END OF DOCUMENT**

# Document 00 21 13 - Instructions to Bidders (General Contracting / Electronic Bid) State of Ohio Standard Requirements for Public Facility Construction

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## ARTICLE 1 - GENERAL INSTRUCTIONS

### 1.1 Applicable Law and Forum

1.1.1 The rights of any Bidder or any party to a subsequent Contract shall be governed by the laws of the state of Ohio and only Ohio courts shall have jurisdiction over any action or proceeding related to the Bid or any subsequent Contract. The Bidder irrevocably consents to such jurisdiction.

### 1.2 Project Scheduling and Coordination

1.2.1 When the Contract Documents refer to a period of time by a number of days, it excludes the first day and includes the last day of the period. If the last day of the period falls on a Saturday, Sunday, or a legal holiday, that day shall be omitted and the period shall end on the next day which is not a Saturday, Sunday, or legal holiday.

1.2.2 The time for completion of the Project indicated on the electronic **Bid Form** is the time for Substantial Completion of all Work applicable to the Bidder.

1.2.3 The State may assign all or any portion of its interest in a Contract with one or more of the successful Bidders to another successful Bidder as an agreed condition for an award of the Contract for the respective Bid. The assignment may include, without limitation, the duty to schedule, coordinate, and administer the Contract.

1.2.4 The Contractor is responsible for scheduling the Project, coordinating the Subcontractors, and providing other services identified in the Contract Documents.

1.2.5 By submitting its Bid, the Bidder indicates its understanding that the Contract Sum, based on its Bid and as amended by Change Orders, includes all costs that the Contracting Authority owes the Bidder.

### 1.3 Written Notice

1.3.1 Notice under the Contract Documents shall be validly given if:

1.3.1.1 delivered personally to a member of the organization for whom the notice is intended;

1.3.1.2 delivered, or sent by registered or certified mail, to the last known business address of the organization; or

1.3.1.3 sent by facsimile, email, or web-based project management software, provided the original signed document is delivered within 3 business days after the date of the electronic transmission.

1.3.2 Notices provided to one Project Participant from another shall be simultaneously copied to the prospective Bidders, the Owner, the Contracting Authority, and the A/E.

### 1.4 Use of the State's Electronic Bidding Software

1.4.1 The Bidder shall use the State's Electronic Bidding Software to submit its Bid for this Project. Paper Bids will not be accepted.

1.4.2 Bidders, Subcontractors, and Material Suppliers may download the Contract Documents as PDF files from the State's Electronic Bidding Software at no charge by registering and associating with a company at <https://bidexpress.com>.

1.4.3 Bidders are encouraged to print and submit their signed and notarized Digital ID to the vendor at the address shown on the "Bid Express Digital ID Registration" page well in advance of the bid deadline.



**1.4.4** Bidders are also encouraged to click the “Select for Bidding” link on the electronic **Bid Form** to be listed on the electronic Plan Holder’s list and submit payment to receive notifications regarding Addenda and other announcements.

**1.4.5** Subcontractors and Material Suppliers may view the electronic Plan Holder’s list to determine potential Bidders.

**1.4.6** Bidders, Subcontractors, and Material Suppliers are encouraged to attend a contractor webinar or contact the vendor’s help desk through the means identified at <https://bidexpress.com> to increase their knowledge of using the State’s Electronic Bidding Software.

## ARTICLE 2 - BIDDING PROCEDURES

### 2.1 Examination of Contract Documents and the Site

**2.1.1** Before submitting a Bid, the Bidder shall examine all Contract Documents, including, but not limited to, the Drawings, Specifications, and Addenda for all divisions of Work for the Project, noting in particular all requirements that may affect its Work in any way.

**2.1.2** The Bidder’s failure to become acquainted with the extent and nature of Work required to complete any portion of the Work in conformity with the requirements of the Contract Documents, shall not be a basis for additional compensation.

**2.1.3** Before submitting a Bid, the Bidder should not only examine and evaluate the Site and related Project conditions where the Work will be performed, but shall also consider when the Work will be performed including, but not limited to, the following:

**2.1.3.1** the condition, layout, and nature of the Site and surrounding area;

**2.1.3.2** the availability and cost of labor;

**2.1.3.3** the availability and cost of materials, supplies, and equipment;

**2.1.3.4** the cost of temporary utilities required in the Bid;

**2.1.3.5** the cost of any permit or license required by a local or regional authority having jurisdiction over the Project;

**2.1.3.6** the usual weather conditions of the Project location;

**2.1.3.7** conditions bearing upon transportation, disposal, handling, and storage of equipment, materials, and waste; and

**2.1.3.8** subsurface and concealed physical conditions and related information provided in the Contract Documents.

### 2.2 Pre-Bid Meeting

**2.2.1** The Bidder is encouraged to attend the pre-bid meeting, where the A/E, the Contracting Authority, and the Owner will receive questions regarding the Contract Documents. If not given in **Document 00 10 00 - Solicitation**, the A/E shall issue notice of the time and place of any pre-bid meeting to each registered Plan Holder.

**2.2.2** The A/E shall prepare minutes of the pre-bid meeting for the Project record. If questions raised by the prospective Bidders require changes to, or clarifications of, the Contract Documents, the A/E shall issue the changes by written Addendum, along with a list of pre-bid meeting attendees.

**2.2.3** Additional compensation shall not be based upon the Bidder’s failure to attend the pre-bid meeting, which results in the Bidder’s incomplete knowledge and familiarity of the Project requirements.

### 2.3 Request for Interpretation

**2.3.1** If the Bidder finds any perceived ambiguity, conflict, error, omission, or discrepancy within the Contract Documents, including the Drawings, Specifications, and Addenda, or between any of the Contract Documents and Applicable Law, the Bidder shall submit a written Request for Interpretation (“RFI”) to the A/E for an interpretation or clarification.

**2.3.1.1** The Bidder is responsible for prompt delivery of the RFI.

**2.3.1.2** The A/E shall respond to RFIs received more than 7 days before the bid opening.

**2.3.2** The A/E shall issue Addenda in response to RFIs that modify or clarify the Contract Documents. Any Addenda issued within 72 hours before any bid opening (excluding Saturdays, Sundays, and legal holidays) shall extend the bid opening date by 7 days pursuant to **Section 3.3.1**.

**2.3.2.1** The Addenda may be delivered via the State's State's Electronic Bidding Software, facsimile or e-mail, posted to a web or FTP site, or otherwise furnished to each registered Plan Holder.

**2.3.3** Any interpretation or clarification of the Contract Documents made by any Person other than the A/E, in any manner other than a written Addendum, shall not be binding, and the Bidder shall not rely upon the interpretation or clarification.

**2.3.4** The successful Bidder shall not be compensated for a claim alleging insufficient data, incomplete, ambiguous, conflicting, or erroneous Contract Documents or proposed Contract Documents, or assumed conditions regarding the nature, extent, or character of the Work, if the Bidder did not submit a related RFI prior to the bid opening.

## **2.4 Basis of Design and Acceptable Components**

**2.4.1** The Contract Documents may list components produced by specific manufacturers to denote kind, quality, or performance requirements.

**2.4.2** The component listed first is the Basis of Design Component.

**2.4.3** Other listed components are Acceptable Components.

**2.4.3.1** If the Bidder includes an Acceptable Component in its Bid, the Bidder is responsible for the costs of coordination and modification required.

## **2.5 Substitutions Prior to Bid Opening**

**2.5.1** If the Bidder proposes to use an article, device, material, equipment, form of construction, fixture, or item other than the Basis of Design or Acceptable Components named in the Specifications, the Bidder shall certify that the proposed item is equal in quality and all aspects of performance and appearance, to the item specified.

**2.5.1.1** If approval of a Substitution requires changes to the Contract Documents or affects the work of other trades, the Bidder is responsible for the additional costs, including, but not limited to, changes to the design by the A/E.

**2.5.2** The Bidder shall submit its request for Substitution to the A/E no later than 10 days prior to the bid opening, which must include:

**2.5.2.1** the name and complete description of the proposed Substitution, including Drawings, performance and test data, and other information necessary for a complete evaluation; and

**2.5.2.2** a statement setting forth any changes that the Proposed Substitution will require in the Contract Documents or the Project.

**2.5.3** If the A/E approves the Proposed Substitution, the A/E shall issue an Addendum.

**2.5.4** If the A/E does not approve the Proposed Substitution, the A/E shall inform the Bidder of its decision, which is final. The A/E may reject a proposed Substitution because the Bidder failed to provide sufficient information to enable the A/E to completely evaluate the Proposed Substitution without causing a delay in the bid deadline.

**2.5.5** Proposed Substitutions received by the A/E less than 10 days prior to the bid deadline shall not be considered.

## **2.6 Electronic Bid Form**

**2.6.1** Each Bid shall be submitted on the electronic **Bid Form** through the State's Electronic Bidding Software.

**2.6.1.1** All sections of the electronic **Bid Form**, including a completed "Bidder Affirmation and Disclosure" section acknowledging that the Bidder affirms, understands, and will abide by the requirements of Executive Order 2019-12D, and a completed "Commitment to Participate in the EDGE Business Assistance Program" page, shall be submitted with the Bid. Failure to do so may cause the Bid to be rejected as non-responsive.

**.1** If the names, locations, and service locations of Subcontractors are not known at the time of the Bid deadline, the Bidder must provide the information requested with its **Subcontractor and Material Supplier Declaration**.

**2.6.1.2** Unless the Bidder withdraws the Bid as provided in **Article 4**, the Bidder is required to comply with all requirements of the Contract Documents, regardless of whether the Bidder had actual knowledge of the requirements and regardless of any statement or omission made by the Bidder that might indicate a contrary intention.

**2.6.2** The Bidder shall fill in all relevant spaces on the electronic **Bid Form**. The State's Electronic Bidding Software will identify any incomplete required fields.

**2.6.3** If the Bidder is a corporation, partnership, or sole proprietorship, an officer, partner or principal of the Bidder shall enter the legal name of the Bidder in the space provided on the electronic **Bid Form**. If the Bidder is a joint venture, an officer, partner or principal, as applicable, of each member of the joint venture shall enter the legal name of the applicable member in the space provided.

## 2.7 Allowances

**2.7.1** If Allowances are provided on the electronic **Bid Form**, the amount of each Allowance shall be included in the Base Bid amount. Allowances shall be used solely for the purpose of determining the adjustment to the Contract Sum for the difference between the amount of the Allowance and the actual cost of the related Work provided. Allowances shall not include the Contractor's Fee.

## 2.8 Unit Prices

**2.8.1** If Unit Prices are requested on the electronic **Bid Form**, the amount of the scheduled quantities shall be included in the Base Bid amount. Unit prices shall be used solely for the purpose of determining the adjustment to the Contract Sum for the difference between the estimated quantities on the electronic **Bid Form** and the actual quantities provided.

**2.8.2** Unit Prices shall include all materials, equipment, labor, delivery, installation, and any other cost or expense, in connection with, or incidental to, the performance of that portion of the Work. Unit Prices shall not include the Contractor's Fee on account of the associated Unit Price Work. The Bidder shall submit Unit Prices for all items listed.

## 2.9 Alternates

**2.9.1** If an Alternate is listed on the electronic **Bid Form**, the Bidder shall fill in the applicable space with a positive or negative bid amount as applicable. The Contracting Authority reserves the right to accept or reject any or all bid amounts for Alternates, in whole or in part, and in any order.

**2.9.1.1** If no change in the bid amount is required, indicate "\$0."

**2.9.1.2** Failure to make an entry on any Alternate shall cause the Bid to be rejected as non-responsive if that Alternate is selected.

**2.9.1.3** Failure to indicate a negative number will indicate the Bidder's intent to increase the Base Bid by the amount entered in the applicable space.

**2.9.1.4** If an Alternate is not selected, an entry as listed in **Section 2.9.1.2** on that Alternate shall not, by itself, render a Bid non-responsive.

## 2.10 Submittals with Electronic Bid Form

**2.10.1** The Contracting Authority shall reject a Bid as non-responsive if the Bidder fails to submit the following with the Bid:

**2.10.1.1** An electronic facsimile of the Bid Guaranty as provided in **Article 5**, meeting the requirements of Ohio Revised Code ("ORC") Sections 153.54 and 153.571.

**2.10.1.2** The original unaltered Bid Guaranty shall be delivered to the Contracting Authority within 3 business days after the public bid opening as provided in Ohio Administrative Code ("OAC") Section 153:1-8-01(H).

**2.10.2** If the apparent low Bidder does not submit a valid Power of Attorney of the agent signing for the Surety with its Bid, the Contracting Authority shall direct the apparent low Bidder to deliver a valid and appropriate Power of Attorney to the Contracting Authority within a period determined by the Contracting Authority. The Contracting Authority shall not enter into a Contract without a valid Power of Attorney.

**2.10.3** The Bidder is encouraged to submit background information with its Bid using the **Bidder's Qualifications** form and including, but not limited to, the information listed in this **Section 2.10**. If the apparent low Bidder does not submit the **Bidder's Qualifications** form and related information attached to the electronic **Bid Form**, the Bidder shall provide it upon request in accordance with **Section 3.5.4**, including, but not limited to:

**2.10.3.1** the overall experience of the Bidder, including number of years in business under present and former business names;

**2.10.3.2** a complete listing of all the Bidder's ongoing construction projects and a listing of construction projects which are similar in cost and type to the Project completed by the Bidder in the last 5 years. Include information of the scope of work and value of each contract, a description of Encouraging Diversity Growth and Equity ("EDGE") participation and performance, and a project name/contact Person/address/phone number for the owner and the architect or engineer for each project;

- 2.10.3.3** a Certificate of Compliance with Affirmative Action Programs, issued pursuant to ORC Section 9.47, by the Equal Opportunity Coordinator of the Department of Administrative Services;
- 2.10.3.4** a complete listing of Affirmative Action and EDGE program violations in the last 5 years;
- 2.10.3.5** a complete listing of Prevailing Wage, EPA, OSHA, or other regulatory entity issues or violations in the last 5 years;
- 2.10.3.6** a complete listing of judgments, claims, arbitration proceedings or suits pending or outstanding in the last 5 years;
- 2.10.3.7** a complete listing of Drug-Free Workplace Program and Drug-Free Safety Program (“DFSP”) violations in the last 5 years;
- 2.10.3.8** upon request of the Contracting Authority, the apparent low Bidder shall submit the following information, which is not a public record under ORC Section 149.43; and shall remain confidential, except under proper order of a court:
- .1** an annual financial statement prepared within the 12 months prior to the bid opening by an independent licensed accounting firm; and the name, address, contact Person, and phone number of the bank normally used by the Bidder for its primary banking; or
  - .2** a financial report generated within 30 days prior to the bid opening from Standard and Poor, Dun and Bradstreet or a similar company acceptable to the Contracting Authority documenting the financial condition of the Bidder; and the name, address, contact Person, and phone number of the bank normally used by the Bidder for its primary banking.
- 2.10.3.9** a description of the Bidder’s relevant facilities and major equipment, whether leased or owned;
- 2.10.3.10** a description of the management experience of the Bidder’s project manager(s) and superintendent(s) and a comprehensive resume for each;
- 2.10.3.11** a description of the EDGE-certified Business Enterprises the Bidder proposes as Subcontractors for this Project by attaching a fully completed **EDGE Affidavit** form for each EDGE-certified Business Enterprise;
- 2.10.3.12** to support a Bond, a current and signed Certificate of Compliance issued by the Ohio Department of Insurance, showing the Surety is licensed to do business as a surety in Ohio;
- 2.10.3.13** a current Ohio Workers' Compensation Certificate;
- 2.10.3.14** if the Bidder is a foreign corporation not incorporated under the laws of Ohio, a Certificate of Good Standing from the Ohio Secretary of State; or, if the Bidder is a foreign person or partnership, evidence that the Bidder filed, with the Ohio Secretary of State, a Power of Attorney designating the Ohio Secretary of State as the Bidder's agent for the purpose of accepting service of summons in any action brought under ORC Section 153.05 or under ORC Sections 4123.01 to 4123.94, inclusive;
- 2.10.3.15** evidence that the Bidder is enrolled in, and in good standing in, a DFSP approved by the Ohio Bureau of Workers’ Compensation (“OBWC”); and
- 2.10.3.16** any other data or information which the A/E may request concerning the responsibility of the Bidder, including a complete list of major Subcontractors with an estimated contract value of \$200,000 or more, which the Bidder proposes to employ on the Project.

## **2.11 Changes in the Bid Amount**

- 2.11.1** Any change to a previously submitted Bid shall be resubmitted through the State’s Electronic Bidding Software prior to the deadline for submission of Bids.

## **ARTICLE 3 - BID OPENING AND EVALUATION**

### **3.1 Delivery of Bid**

- 3.1.1** The Bidder shall submit its Bid to the Contracting Authority prior to the time of the bid deadline.
- 3.1.2** Bids that are submitted after the time of the bid deadline shall not be considered.

### **3.2 Bid Opening**

- 3.2.1** Electronic Bids shall be received until the time stated when all Bids shall be electronically opened and the Bid tabulation made public by posting on the State’s Electronic Bidding Software.

**3.2.2** The posting of Bid tabulations is for informational purposes only and is not to be construed as an acceptance or rejection of any Bid submitted.

**3.2.3** The contents of the electronic **Bid Form** and its attachments are public records and shall be available for inspection, upon request, at any time after the bid deadline, except for any information that is not defined as a public record under Ohio law.

### **3.3 Bid Deadline Extension**

**3.3.1** If an Addendum is issued within 72 hours prior to the published time for the bid deadline, excluding Saturdays, Sundays and legal holidays, the bid deadline shall be extended 7 days. If the Contracting Authority approves, the bid deadline may be extended for more than 7 days, and consideration for additional advertising may be recommended.

**3.3.2** As part of issuing any Addendum earlier than 72 hours prior to the published time for the bid deadline, excluding Saturdays, Sundays and legal holidays, only the Contracting Authority may approve a revised bid deadline or additional advertising.

### **3.4 Bid Evaluation Criteria**

**3.4.1** The Contracting Authority reserves the right to accept or reject any or all Bids, in whole or in part, and reserves the right to award the Contract to any remaining Bidder the Contracting Authority determines, in its sole discretion, to have submitted the lowest responsive and responsible Bid.

**3.4.2** The Contracting Authority reserves the right to accept or reject any or all Alternates. Alternates may be accepted or rejected in any order.

**3.4.3** If any Bidder has engaged in collusive bidding, the Contracting Authority shall reject that Bidder's Bid as non-responsive for the Contract. A collusive bidder may also be debarred from future State Contracts.

**3.4.4** The Contracting Authority reserves the right to waive, or to allow any Bidder a reasonable opportunity to cure a minor irregularity or technical deficiency in a Bid, provided the irregularity or deficiency does not affect the bid amount, or otherwise give the Bidder a competitive advantage. Noncompliance with any material requirements of the Contract Documents shall cause a Bid to be rejected as non-responsive.

**3.4.5** If, in the opinion of the Owner, the award of the Contract to the lowest Bidder is not in the best interest of the State, with the written consent of the Contracting Authority, the Owner may accept, in its discretion, another Bid so opened, or the Contracting Authority may reject all Bids and advertise for other Bids. The advertisement shall be for the period, in the form, and in the publications directed by the Contracting Authority.

### **3.5 Bid Evaluation Procedure**

**3.5.1** The Contract shall be awarded to the lowest responsive and responsible Bidder as determined in the discretion of the Contracting Authority, or all Bids may be rejected in accordance with Applicable Law.

**3.5.1.1** In determining which Bid is the lowest, the Contracting Authority shall consider the Base Bid and the bid amounts for any Alternate, or Alternates, which the Owner decides, in its sole discretion, to accept.

**3.5.1.2** The total of the bid amounts for the accepted Alternate(s) shall be added to, or deducted from, the Base Bid, as applicable, for determining the lowest Bidder.

**3.5.1.3** If two Bidders submit the same bid amount and both are determined to be responsive and responsible, the Contracting Authority may select one Bidder by the flip of a coin, which shall be conducted in the presence of both Bidders and shall be final.

- .1** If one of the Bidders refuses to participate in, or fails to be present at, the flip of a coin, the remaining Bidder shall be selected.

**3.5.2** A Bidder for a Contract shall be considered responsive if the Bidder's Bid responds to the Contract Documents in all material respects and contains no irregularities or deviations from the Contract Documents that would affect the amount of the Bid or otherwise give the Bidder a competitive advantage.

**3.5.2.1** A Bid shall be rejected as non-responsive if the Bid contains a Bid Guaranty executed by a Surety not licensed in Ohio or a Bid Guaranty that is otherwise determined to be insufficient by the Contracting Authority.

**3.5.2.2** The Bidder may be subject to a Pre-Award Affirmative Action Compliance Review pursuant to OAC Section 123:2-5-01 including a review of the Bidder's employment records and an on-site review.

- .1** The Bidder must submit the information requested no later than 10 days after receipt of the request. Failure to timely respond to this request for records may result in the Bidder being found non-responsive.

**3.5.2.3** If the lowest Bidder is non-responsive, the Bidder shall be notified according to **Section 3.6**.

**3.5.3** In determining whether a Bidder is responsible, factors to be considered include, without limitation:

**3.5.3.1** preferences required by law, where applicable;

**3.5.3.2** the experience of the Bidder;

**3.5.3.3** the financial condition of the Bidder;

**3.5.3.4** the conduct and performance of the Bidder on previous Contracts, including compliance with Equal Employment Opportunity in the Construction Industry Administrative Rules, OSHA and Prevailing Wage laws, and demonstration of good faith effort to participate in the EDGE Business Development program, or actual participation in the EDGE Business Development program, or both, as indicated in the ORC and the Ohio Administrative Code;

**3.5.3.5** the facilities of the Bidder;

**3.5.3.6** the management skills of the Bidder, including the capability of the Bidder to construct and manage the entire Project, including but not limited to the plumbing, fire protection, heating, ventilating and air conditioning, and electrical branches or classes of the Work; and

**3.5.3.7** the Bidder's ability to execute the Contract properly, including past performance of the Bidder and the Subcontractors that the Bidder proposes to use on the Project.

**3.5.4** The A/E shall obtain from the lowest responsive Bidder any information the Contracting Authority determines appropriate to consideration of factors showing responsibility. If the lowest responsive Bidder is responsible, the Contract shall be awarded to that Bidder, unless all Bids are rejected. The Bidder shall provide all requested information within 3 days of a request from the A/E, or a longer period, if the Contracting Authority consents in writing.

**3.5.5** If the lowest responsive Bidder is not responsible, the Contracting Authority shall evaluate the next lowest Bidder according to the procedures set forth in this **Section 3.5** until the Contract is awarded, all Bids are rejected, or all responsive Bidders are determined to be not responsible.

### **3.6 Rejection of Bid**

**3.6.1** If the lowest Bidder is not responsive or responsible, the Contracting Authority shall reject the Bid and notify the Bidder in writing by Certified Mail of the finding and the reasons for the finding.

#### **3.6.2 Ten Percent Rule.**

**3.6.2.1** If the lowest responsive and responsible Bid for the Contract, including the Base Bid and accepted Alternates if any, exceeds an amount 10 percent greater than the published Estimated Construction Cost for the Contract, the Contracting Authority shall reject all Bids.

**3.6.3** A Bidder notified in accordance with **Section 3.6.1** may object to its rejection by filing a written protest, which must be received by the Contracting Authority within 5 days of the notification provided pursuant to **Section 3.6.1**.

**3.6.4** Upon receipt of a timely protest, the Contracting Authority shall meet with the protesting Bidder to hear its objections. ORC Chapter 119 administrative hearing requirements are not applicable to the bid protest meeting.

**3.6.4.1** No Contract award shall become final until after the Contracting Authority has met with all Bidders who have timely filed protests and the award of the Contract is affirmed by the Contracting Authority.

**3.6.4.2** If all protests are rejected, the Contract shall be awarded to the lowest responsive and responsible Bidder, or all Bids shall be rejected.

### **3.7 Notice of Intent to Award**

**3.7.1** The Contracting Authority shall notify the apparent successful Bidder that upon satisfactory compliance with all conditions precedent for execution of the Contract, within the time specified, the Bidder shall be awarded the Contract.

**3.7.2** The Contracting Authority reserves the right to rescind any Notice of Intent to Award if the Contracting Authority determines it issued the Notice of Intent to Award in error, or if the conditions precedent for execution of Contract set forth in **Article 6** are not met.

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**ARTICLE 4 - WITHDRAWAL OF BID****4.1 Withdrawal prior to Bid Opening**

**4.1.1** A Bidder may withdraw a Bid after submitting the Bid through the State's Electronic Bidding Software, provided the Bidder submits its request through the State's Electronic Bidding Software prior to the bid deadline.

**4.2 Withdrawal after Bid Opening**

**4.2.1** The Bid shall remain valid and open for acceptance for a period of 60 days after the bid opening; provided, however, a Bidder may withdraw a Bid from consideration after the bid opening if the bid amount was substantially lower than the amounts of other Bids, providing the Bid was submitted in good faith, and the reason for the bid amount being substantially lower was a clerical mistake, as opposed to a judgment mistake, and was actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of Work, labor, or material made directly in the compilation of the bid amount.

**4.2.1.1** Notice of a request to withdraw a Bid shall be made in writing filed with the Contracting Authority within 2 business days after the bid opening. The Contracting Authority reserves the right to request the Bidder to submit evidence substantiating the Bidder's request to withdraw the Bid.

**4.2.1.2** No Bid may be withdrawn under **Section 4.2.1** which would result in awarding a Contract involving the same item on another Bid to the same Bidder.

**4.2.2** If a Bidder withdraws its Bid under **Section 4.2.1**, the Contracting Authority may award the Contract to the next lowest responsive and responsible Bidder, or reject all Bids and advertise for other Bids. In the event the Contracting Authority advertises for other Bids, the withdrawing Bidder shall pay the costs, in connection with the re-bidding, of printing new Contract Documents, required advertising, and printing and mailing of notices to prospective Bidders, if the Contracting Authority finds that these costs would not have been incurred but for the withdrawal.

**4.2.3** A Bidder may withdraw the Bidder's Bid at any time after the 60-day period described in **Section 4.2.1** by giving written notice to the Contracting Authority.

**4.3 Refusal to Accept Withdrawal**

**4.3.1** If the Contracting Authority contests the right of a Bidder to withdraw a Bid pursuant to **Section 4.2.1**, a hearing shall be held within 10 days after the bid opening and the Contracting Authority shall issue an order allowing or denying the claim of this right within 5 days after the hearing is concluded. The Contracting Authority shall give the withdrawing Bidder timely notice of the time and place of the hearing.

**4.3.1.1** The Contracting Authority shall make a stenographic record of all testimony, other evidence, and rulings on the admissibility of evidence presented at the hearing. The Bidder shall pay the costs of the hearing.

**4.3.1.2** Pursuant to ORC Section 119.12, the Bidder may appeal the order of the Contracting Authority required by **Section 4.3.1**.

**4.4 Refusal to Perform**

**4.4.1** In the event the Contracting Authority denies the request for withdrawal and the Bidder refuses to perform the Contract, the Contracting Authority may reject all Bids or award the Contract to the next lowest responsive and responsible Bidder.

**4.5 Effect of Withdrawal**

**4.5.1** A Bidder, who is permitted to withdraw a Bid under **Section 4.2.1**, shall not supply material or labor to, or perform a subcontract or other work for, the Person to whom the Contract is awarded; or otherwise benefit, directly or indirectly, from the performance of the Project for which the withdrawn Bid was submitted; without the Contracting Authority's prior written consent.

**ARTICLE 5 - BID GUARANTY AND BOND****5.1 Bid Guaranty**

**5.1.1** The Bidder shall submit a Bid Guaranty with the Bidder's Bid, payable to the Contracting Authority, in the form of either:

**5.1.1.1** the signed **Document 00 43 13 - Bid Security Form** contained in the Contract Documents for the amount of the Base Bid plus all additive Alternates; or

**5.1.1.2** a certified check, cashier's check, or letter of credit, for 10 percent of the Base Bid, plus all additive Alternates – a letter of credit shall expressly provide that it is revocable only by the Contracting Authority.

**5.1.2** The Bid Guaranty shall be in form and substance satisfactory to the Contracting Authority and shall serve as an assurance that upon acceptance of the Bid, the Bidder shall comply with all conditions precedent for Contract execution, within the time specified by the Contracting Authority.

**5.1.3** If the blank line on the **Bid Security Form** is not filled in, the penal sum shall be the full amount of the Base Bid plus all additive Alternates. If the blank line is filled in, the amount shall not be less than the full amount of the Base Bid plus all additive Alternates, stated in dollars and cents. A percentage is not acceptable. In the event the blank line is filled in for an amount less than the full amount of the Base Bid plus all additive alternates, the Bid shall be rejected as non-responsive.

**5.1.4** An authorized agent must sign the **Bid Security Form**, and the Bidder shall provide a Power of Attorney from the Surety. A Surety authorized by the Ohio Department of Insurance to transact business in Ohio must issue the **Bid Security Form**.

**5.1.5** The requirements of ORC Section 3901.86 may be applicable requiring an Ohio resident agent countersign the **Bid Security Form**. The Bidder shall determine the applicability of this provision.

**5.1.6** Bid Guaranties in the form of a certified check, cashier's check, or letter of credit shall be returned to unsuccessful Bidders 60 days after the bid opening. Bid Guaranties in the form of a certified check, cashier's check, or letter of credit shall be returned to the successful Bidder upon providing **Document 00 61 13 - Performance and Payment Bond Form** from a Surety satisfactory to the Contracting Authority.

**5.2 Forfeiture of Bid Guaranty**

**5.2.1** If for any reason, other than as authorized by **Section 4.2.1** or **Section 5.3**, the Bidder fails to execute the Agreement, and the Contracting Authority awards the Contract to another Bidder, which the Contracting Authority determines is the lowest responsive and responsible Bidder:

**5.2.1.1** The Bidder who failed to execute the Agreement is liable to the State for the difference between its Bid and the Bid of the next lowest responsive and responsible Bidder, or for a penal sum not to exceed ten percent of the bid amount, whichever is less.

**5.2.2** If the Contracting Authority then awards a Contract to another Bidder, which the Contracting Authority determines is the lowest responsive and responsible Bidder and that Bidder fails or refuses to execute the Agreement:

**5.2.2.1** The liability of the lowest responsive and responsible Bidder shall be the difference between the bid amount of the lowest responsive and responsible Bidder and another Bidder which the Contracting Authority determines is the lowest responsive and responsible Bidder, except as provided in **Section 5.3**, but not in excess of the liability specified in **Section 4.2.2**.

**5.2.2.2** The liability on account of an award to the lowest responsive and responsible Bidder beyond the third lowest responsive and responsible Bidder shall be determined in like manner.

**5.2.3** If the Contracting Authority does not award the Contract to another Bidder under **Section 5.2.2**, but submits the Project for re-bidding:

**5.2.3.1** The Bidder failing or refusing to execute the Agreement is liable to the State for a penal sum not to exceed 10 percent of the Bidder's bid amount or the costs in connection with the resubmission of printing new Contract Documents, required advertising, and printing and mailing notices to prospective Bidders, whichever is less, except as provided in **Section 5.3**.



### 5.3 Exception to Forfeiture

**5.3.1** A Bidder for a Contract with the State costing less than \$500,000 may withdraw its Bid from consideration if its Bid for another Contract with the State for less than \$500,000 has already been accepted if:

**5.3.1.1** the Bidder certifies in good faith that the total amount of its current contracts is less than \$500,000; and

**5.3.1.2** the Bidder's Surety certifies in good faith that the Bidder is unable to perform the subsequent Contract because such performance would exceed the Bidder's bonding capacity.

**5.3.2** If a Bid is withdrawn pursuant to **Section 5.3.1**:

**5.3.2.1** the Contracting Authority may award the Contract to another Bidder which the Contracting Authority determines is the lowest responsive and responsible Bidder or reject all Bids and submit the Project for re-bidding; and

**5.3.2.2** neither the withdrawing Bidder nor the Bidder's Surety shall be liable for the difference between the Bidder's Bid and that of the next lowest responsive and responsible Bidder for a penal sum, or for the costs of printing new Contract Documents, required advertising, and printing and mailing notices to prospective Bidders.

### 5.4 Bond

**5.4.1** Prior to signing the Agreement, the Bidder shall provide the Bond required by law in form and substance satisfactory to the Contracting Authority, and from a Surety licensed to do business in the state of Ohio and satisfactory to the Contracting Authority.

**5.4.1.1** If the Bidder provided **Document 00 43 13 - Bid Security Form**, described in **Section 5.1.1.1**, as its Bid Guaranty then that form shall be the Bond.

**5.4.1.2** If the Bidder provided another form of Bid Guaranty, described in **Section 5.1.1.2**, then **Document 00 61 13 - Performance and Payment Bond Form**, described in **Section 5.1.6**, shall be the Bond.

**5.4.1.3** The Bidder shall not be required to provide both forms described above.

**5.4.2** The Bond must be in the full amount of the Contract to indemnify the State against all direct and consequential damages suffered by failure of the Contractor to perform according to the provisions of the Contract and in accordance with the Plans, Specifications, details, and bills of material therefore and pay all lawful claims of Subcontractors, Material Suppliers, and laborers for labor performed or materials furnished in performing and completing the Contract.

## ARTICLE 6 - CONTRACT AWARD AND EXECUTION

### 6.1 Conditions Precedent for Execution of Contract

**6.1.1** The successful Bidder must submit the items in this **Section 6.1** to the Contracting Authority before executing the Agreement.

**6.1.2** Bond, and to support the Bond, a Certificate of Compliance issued by the Ohio Department of Insurance, showing the Surety is licensed to do business in the state of Ohio.

**6.1.3** Ohio Workers' Compensation Certificate

**6.1.4** Certificate of Compliance with Affirmative Action Programs, issued by the Equal Opportunity Coordinator. The form must be submitted through the Ohio Business Gateway: <http://business.ohio.gov/efiling/>.

**6.1.5** Certificate of Insurance (ACORD form is acceptable) and copy of additional insured or loss payee endorsement. The Contracting Authority reserves the right to request and receive a certified copy of the Contractor's insurance policies.

**6.1.6** If a Bidder is a foreign corporation (e.g., not incorporated under the laws of Ohio) it must submit a Certificate of Good Standing from the Ohio Secretary of State showing the right of the Bidder to do business in the state of Ohio.

**6.1.7** If a Bidder is an individual or partnership, nonresident of the State, it must submit a Power of Attorney designating the Ohio Secretary of State as the Bidder's agent for accepting service of summons in any action brought under ORC Section 153.05 or under ORC Sections 4123.01 to 4123.94, inclusive.

**6.1.8** Evidence that the Bidder is enrolled in, and in good standing in, a DFSP approved by the OBWC.

**6.1.9 Required Notice of Unresolved Findings for Recovery.**

**6.1.9.1** By submitting its Bid, the Bidder warrants that it is not subject to an unresolved findings for recovery under ORC Section 9.24. ORC Section 9.24 prohibits the State from awarding a Contract to any Bidder against whom the Auditor of State has issued a finding for recovery if the finding for recovery is unresolved at the time of award. If the Contract is awarded to a Bidder subject to an unresolved finding for recovery under ORC Section 9.24, the Contract is void on its face and the Contractor shall immediately repay to the Owner any funds paid under the Contract.

**6.1.10 EDGE Program – Supporting Documentation Required.**

**6.1.10.1** The Bidder shall provide evidence acceptable to the Contracting Authority of the Bidder's participation in the EDGE Program by contracting with EDGE-certified Business Enterprise(s) for the Project by submitting a fully completed EDGE Affidavit for each EDGE-certified Business Enterprise, by requesting a waiver or partial waiver of the advertised EDGE Program participation goal for the Project on the Bidder's company letterhead including full documentation of the Bidder's good faith effort to contract with EDGE-certified Business Enterprise(s) for this Project, or both.

**6.1.11** If the Bidder is a joint venture, it must submit the executed agreement between the joint venturers describing the division of services/work and percentage of contract for each company, and a Power of Attorney which authorizes one or more individuals to bind the joint venture and each individual joint venturer to Contract Modifications.

**6.2 Non-compliance with Conditions Precedent**

**6.2.1** The award of the Contract and execution of the Agreement require the Contractor to comply with:

**6.2.1.1** all conditions precedent for execution of the Contract within 10 days of the date of the Notice of Intent to Award; and

**6.2.1.2** the **Bidder's Qualifications** form, including a fully completed **EDGE Affidavit** for each EDGE-certified Business Enterprise, not previously provided within 3 business days of receiving the Contracting Authority's request.

**6.2.2** Non-compliance with the conditions precedent for execution of the Contract as stated in **Section 6.1** within the timelines stated in **Section 6.2.1** following the date of the Notice of Intent to Award shall be sufficient cause to permit the Contracting Authority to cancel the Notice of Intent to Award, for the Bidder's lack of responsibility and award the Contract to another Bidder, which the Contracting Authority determines is the lowest responsive and responsible Bidder; or the Contracting Authority may re-bid the Work at its sole discretion.

**6.2.3** The Contracting Authority may extend the time for complying with the conditions precedent for execution of the Contract for good cause. The extension is not a waiver of the conditions precedent for execution of the Contract.

**6.3 Time Limits**

**6.3.1** The Contracting Authority's failure to award the Contract and execute the Agreement within 60 days of the bid opening invalidates the entire bid process and all Bids submitted, unless the time is extended by written consent of the apparent lowest responsive and responsible Bidder and the Contracting Authority.

**6.3.1.1** If the Contracting Authority awards the Contract within 60 days of the bid opening, increases in material, labor, and subcontract costs shall be borne by the Bidder.

**6.3.1.2** If failure to execute the Contract within 60 days of the bid opening is due to matters for which the State is solely responsible, the Contractor is entitled to a Change Order authorizing payment of verifiable increased costs in materials, labor, or subcontracts. This increase shall not exceed the difference in price between the successful Bidder and the price of the next lowest responsive and responsible Bidder.

**6.3.1.3** If failure to execute the Contract within 60 days of the bid opening is due to matters for which the Contractor is responsible, the Contracting Authority shall not grant a request for increased costs.

**6.4 Notice to Proceed**

**6.4.1** The Contracting Authority shall issue a Notice to Proceed to the Contractor, which establishes the date for commencement and the calendar days allocated for Substantial Completion of all Work. Within 10 days of the date of the Notice to Proceed, or other period as mutually agreed by the Contractor and the Contracting Authority, the Contractor shall furnish the following submittals to the A/E:

**6.4.1.1** Schedule of Values;

**6.4.1.2** preliminary schedule of Shop Drawings and other Submittals;

**6.4.1.3 Subcontractor and Material Supplier Declaration** form, with completed “Bidder Affirmation and Disclosure” forms acknowledging that the Contractor affirms, understands, and will abide by the requirements of Executive Order 2019-12D for Subcontractors that were not identified in the electronic **Bid Form**;

**6.4.1.4** qualifications of proposed project manager(s) and superintendent(s) and a comprehensive resume of each; and

**6.4.1.5** evidence that an authorization agreement for automatic deposit of state warrants has been submitted to Ohio Shared Services using the electronic funds transfer form provided on the Internet at <http://supplier.ohio.gov>.

## 6.5 Prevailing Wage Rates

**6.5.1** The Bidder shall base its Bid upon the prevailing rates of wages as ascertained by the Ohio Department of Commerce, Wage and Hour Bureau for the Project as provided in ORC Sections 4115.03 through 4115.14. Refer to **Document 00 73 43 - Wage Rate Requirements** for related information and the Project’s prevailing rates of wages with an appropriate ratio of registered apprentices.

**6.5.2** The Bidder shall not be entitled to an increase in the Contract Sum on account of an increase in prevailing wage rates, except as otherwise provided by Applicable Law. The Bidder is responsible for compliance of its Subcontractors with prevailing wage requirements.

**6.5.3** Within 10 days of the date of the Notice to Proceed, the Contractor shall provide the Contracting Authority’s Prevailing Wage Coordinator with a schedule of dates during the term of the Contract when the Contractor shall pay wages to its employees for the Project.

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SECTION 003126 – EXISTING HAZARDOUS MATERIALS INFORMATION

**FOR INFORMATION ONLY**

# **PRE- DEMOLITION ASBESTOS CONTAINING MATERIALS INSPECTION REPORT**

**DOT-200023**  
**ODOT D8- Eaton Outpost Garage Building**  
**5656 US Rt. 127,**  
**Eaton, Ohio 45320**  
**(L&A Project 21-0374)**



## **FOR INFORMATION ONLY**

***Prepared for:***

***Mr. Dano Boyne, AIA, NCARB***  
***JMSA Architects***  
***1020 Goodale Boulevard***  
***Columbus, Ohio 43212***  
***(614) 225-9535***

***Prepared by:***

***Lawhon & Associates, Inc.***  
***1441 King Ave***  
***Columbus, Ohio 43212***  
***(614) 481-8600***

***September 7, 2021***



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- D. Inventory of Asbestos Containing Materials
- E. Asbestos Laboratory Analysis Certificates and Chain of Custody
- F. EPA Notification Form



**Pre- Demolition Asbestos Containing Materials Inspection Report**  
**DOT-200023**  
**ODOT D8- Eaton Outpost Garage Building**  
**Eaton, Ohio 45320**

**1.0 Introduction**

Lawhon & Associates, Inc. (L&A) conducted a pre-demolition asbestos containing materials (ACM) inspection of the ODOT D8 Eaton Outpost Garage Building located at 5656 US Rt. 127, Eaton, Ohio 45320. The inspection was conducted on August 24, 2021 by Mr. Aris Neace Ohio Environmental Protection Agency (OEPA) Certified Asbestos Hazard Evaluation Specialist (CAHES), [AHES #ES36144] of L&A and Mr. Josh Rankin [AHES #ES36263]. The consultant's certifications are attached in **Appendix A**.

The purpose of the inspection was to determine the presence of asbestos containing materials (ACMs) prior to the upcoming proposed demolition of the structure. Roofing materials and inaccessible materials were not included in this effort; general assumptions have been made for these materials. Any suspect materials uncovered during demolition activities that are not included in this report will require further inspection in order to conform to the requirements of the Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants (NESHAPs) prior to demolition should they be found. This report should not be used as a remediation design or bid specification document.

**2.0 Asbestos Containing Material Summaries**

Asbestos containing materials are governed by the Environmental Protection Agency's (EPA) National Emission Standards of Hazardous Air Pollutants (NESHAP) during a demolition. These materials are defined as containing greater than one percent asbestos. The Occupational Safety and Health Administration (OSHA) govern building materials containing any amount of asbestos.

The Clean Air Act (CAA) of 1970 required the EPA to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health; therefore, EPA promulgated the National Emission Standards for Hazardous Air Pollutants (NESHAP) (Title 40, CFR Part 61) on April 6, 1973. NESHAP is intended to minimize the release of asbestos fibers during certain activities (i.e., renovations, demolition, and installations). It specifies work practices to be followed during renovations of buildings (except apartment buildings that have no more than four dwelling units), which contain a specific amount of friable asbestos. NESHAP requires that buildings be inspected for asbestos containing building materials (ACBM) prior to renovation/demolition projects regardless of the age of the structure.

NESHAP also requires owners and operators subject to the asbestos rules to notify delegated state and local agencies and/or the regional EPA offices before demolition or renovation activities begin. In addition, NESHAP requires the removal of all regulated asbestos containing materials (RACM) prior to demolition. Regulated Asbestos-Containing Materials (RACM) are (a) friable asbestos material, which are materials easily reduced to powder with hand pressure (b) Category I non-friable ACM that has become friable, (c) Category I non-friable ACM that will be or has been subjected to

sanding, grinding, cutting or abrading, or (d) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations. (Category I non-friable materials consist of materials such as resilient floor covering products, roofing products, gaskets, and packing. Category II non-friable materials consist of all other non-friable materials such as transite.). NESHAP also requires all ACM (including Category I and II) be removed prior to intentional burning, such as for a fire department training exercise.

The State of Ohio Environmental Protection Agency (OEPA) regulates asbestos activities within the state. Professionals performing asbestos related activities must be certified/ licensed by OEPA.

## **2.1 Methodology**

A list of suspect ACMs was compiled from the investigation of the structure. Materials were categorized into RACM, Category I, and Category II materials. L&A inventoried and procured confirmatory samples of suspect asbestos containing materials.

Materials suspected of containing asbestos were grouped into homogeneous areas for bulk sampling purposes. A homogeneous area is composed of specific material that appears to be the same in color, texture, date of installation or location (e.g., grey spray-applied fireproofing in a specific construction unit).

The number of bulk samples to be procured for each identified homogeneous area of suspected Surfacing Materials, Thermal System Insulations, and Miscellaneous Materials were determined in accordance with 40 CFR 763.

Specifically, Friable and Nonfriable Surfacing Materials (i.e., fireproofing, acoustical plaster, decorative plaster, hard plaster, and textured coatings) were sampled following the guidelines set forth by the USEPA in the document "Asbestos in Buildings - Simplified Sampling Scheme Friable Surfacing Materials." Based upon the square footage of the homogenous surfacing materials, either a minimum of 3, 5, or 7 bulk samples were randomly procured and analyzed. For Thermal System Insulation (TSI), at least 3 random samples of each homogeneous area of TSI were procured and analyzed and 1 sample of patched TSI if it was <6 linear or square feet. For Miscellaneous Materials (MM), at least 2 random samples of each homogeneous area of MM were procured and analyzed.

Bulk sample locations for suspect materials sampled by L&A, and the name and signature and asbestos hazard evaluation specialist number of each person who collected samples are shown on the Asbestos Bulk Sample Diagram found in **Appendix B**.

Samples were placed into clean sealed containers and identified with a unique sample number. Sampling tools were decontaminated between each sampling episode.

All bulk samples were sent to a laboratory certified under the National Voluntary Lab Accreditation Program (NVLAP). The lab used for sample analysis of

asbestos on this project was SanAir Technologies Laboratory (SATL) (NVLAP #600227-0) located at 11709 Chesterdale Road, Cincinnati, Ohio 45246. Samples were analyzed by the EPA Polarized Light Microscopy (PLM) 600 Method. Samples reported with low concentrations of asbestos, <3% asbestos content, were reanalyzed using the EPA Point Count Method to determine a more accurate content.

### 3.0 Asbestos Containing Materials Summaries

The following tables present ACM summaries. A bulk sample summary form summarizing the asbestos bulk samples collected and analyzed is attached in **Appendix C**. An Inventory of Asbestos Containing Materials can be found in **Appendix D**. Laboratory analysis certificates and chain of custody information can be found in **Appendix E**.

#### 3.1 Confirmed Asbestos Containing Materials

The following is a list of materials projected to be impacted by the renovation project confirmed to contain asbestos:

Confirmed Asbestos Containing Material	
White Sink Undercoating (1)	Mudded Fitting (2)

Notes: (1) Category II (probability of becoming friable)  
(2) RACM

#### 3.2 Assumed Asbestos Containing Materials

Bulk sampling could not be conducted due to safety reasons or because doing so would jeopardize the integrity of the use of the material. The following is a list of materials assumed to contain asbestos:

Assumed Asbestos Containing Material
Roofing Materials (1)

Notes: (1) Category I- See **Appendix D** for more information regarding this material.

#### 3.3 Materials Containing 1% or Less Asbestos

The following is a list of materials sampled and confirmed to contain 1% or less asbestos by PLM Point Count analysis. These materials are not regulated by EPA; however, will still need properly handled in accordance with OSHA asbestos standards. EPA notification is not required for abatement of these materials.

Materials Containing 1% or Less Asbestos
Exterior Window Glazing Compound

EPA regulations do not apply to these materials; however OSHA does regulate <1% asbestos materials. The following are the implications for the contractor:

1. Work practice requirements and prohibitions that must be observed REGARDLESS of the exposure levels and of the percentage of asbestos in the installed construction materials are:

- 29 CFR 1926.1101(g)(1)(ii), which requires: **wet methods, or wetting agents, to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup.**

The material should be thoroughly wet at all times during handling, mixing, removal, cutting, application, cleanup and up until it is containerized. This will minimize the potential for exposure through dry dust and fiber release.

- 29 CFR 1926.1101(g)(1)(iii), which requires: **prompt clean-up and disposal of wastes and debris contaminated with asbestos into leak-tight containers.**

The Contractor should provide a "leak-tight container." The trailer is required to be equipped with a bladder bag or lined with polyethylene sheeting which should be taped to seal shut. "Prompt clean-up and disposal" means that asbestos material is to be cleaned up as it is removed and before it dries.

- 29 CFR 1926.1101(g)(3)(i), which prohibits: **high-speed abrasive disc saws that are not equipped with point-of-cut ventilator or enclosures with HEPA filtered exhaust air;**

To reduce dry dust and fiber release exposure.

- 29 CFR 1926.1101(g)(3)(ii), which prohibits: **compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air;**

To reduce dry dust and fiber release exposure.

- 29 CFR 1926.1101(g)(3)(iv), which prohibits: **employee rotation as a means of reducing employee exposure to asbestos.**

Contractor cannot manipulate work shifts as a means of artificially reducing the Permissible Exposure Limit (PEL).

At the start of demolition operations involving materials containing <1% asbestos, a contractor must produce an "Initial Negative Exposure Assessment" in accordance with 29 CFR 1926.1101 (f)(2)(iii)(A-C) to demonstrate that the airborne concentrations of asbestos will not exceed the (PELs).

In order to avoid the need to comply with the elements of the standard that are applicable when either asbestos PEL is exceeded, the contractor conducting the demolition project must produce an initial negative exposure assessment for his/her employees.

There are three potential approaches provided under 29 CFR 1926.1101(f)(2) for producing a negative exposure assessment. These are the use of **objective data, previous air monitoring results, or current air monitoring results.** If the contractor cannot produce a negative exposure assessment with objective data or previous air monitoring results, then the contractor must conduct asbestos exposure monitoring. Until the contractor is able to produce a negative exposure assessment for his/her employees, the contractor must comply with the elements of the standard that are applicable when either asbestos PEL is exceeded.

2. Disposal: The demolition waste, debris contaminated with less than 1 percent asbestos, in accordance with EPA regulations may go to a C&DD landfill. Each landfill has an internal policy on accepting this waste stream. The Demolition Contractor is

responsible for confirming acceptance of this material by their chosen landfill and incorporating associated fees in their bid.

### 3.4 Non-Asbestos Containing Materials

The following table lists materials sampled with laboratory analysis revealing no asbestos detected. If any additional suspect materials not listed in this table or already confirmed or assumed to contain asbestos, that material must be assumed to contain asbestos until further proves otherwise.

Non-Asbestos Containing Material	
2'x4' Ceiling Panel-Pin Hole/Large Fissure	12" Orange Floor Tile and associated Tan Mastic
12" Green Floor Tile and associated Tan Mastic	Cove Base and associated Glue
Spray Applied Fireproofing (>5,000sf)	2'x4' Ceiling Panel-Pin Hole/Medium Fissure
2 <sup>nd</sup> Layer Floor Tile and associated Tan Mastic	Fiberglass Pipe Insulation Sealant
Vibration Dampener	Drywall Systems
Duct Mastic	Exterior Fiberboard
Exterior Window Putty	Exterior Window Caulk

## 4.0 Conclusions

Lawhon & Associates, Inc. (L&A) conducted a pre-demolition asbestos containing materials (ACM) inspection of the ODOT D8 Eaton Outpost Garage Building located at 5656 US Rt. 127, Eaton, Ohio 45320. The inspection was conducted on August 24, 2021 by Mr. Aris Neace and Mr. Josh Rankin of L&A.

The purpose of the inspection was to determine the presence of asbestos containing materials (ACMs). Roofing materials and inaccessible materials were not included in this effort; general assumptions have been made for these materials. Any suspect materials uncovered during demolition activities that are not included in this report will require further inspection in order to conform to the requirements of the Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants (NESHAPs) prior to demolition should they be found.

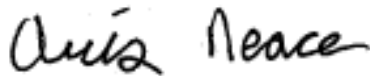
### 4.1 Summary of Results

As a result of the pre-demolition asbestos containing materials survey, the following asbestos containing materials are present and projected to be impacted by the project. According to ODOT guidelines, all ACMs must be removed by an OEPA licensed asbestos abatement contractor prior to demolition.

- White Sink Undercoating (Category II) – 1 sink, 5sf
- Mudded Fitting (RACM) – 1 fitting, 1lf
- Exterior Window Glazing Compound (<1% ACM) – 6 windows, 15sf
- Roofing Materials (Assumed- Category I Non-Friable)- 5,040sf

This report conforms to the EPA NESHAPs requirements prior to demolition. The EPA notification form template is attached in **Appendix F** for your use. If you have any questions, please contact Jordan Mederer at (614) 481-8600.

Sincerely,



Aris Neace, AHES 36144  
Hazardous Materials Technician



Jordan Mederer, AHES 35005  
HBM Department Manager

## **APPENDIX A**

### **Inspector's Certifications**



Mike DeWine, Governor  
Jon Husted, Lt. Governor  
Laurie A. Stevenson, Director

2/9/2021

Michael Neace  
Lawhon & Associates, Inc.  
1441 King Avenue  
Columbus, OH 43212

RE: Evaluation Specialist  
Certification Number: ES36144  
Expiration Date: 3/24/2022

Dear Michael Neace:

This letter and enclosed certification card approves your request to be certified as an asbestos Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Ohio Environmental Protection Agency (EPA) for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please contact the Asbestos Program at 614-644-0226 or by email at [asbestoslicensing@epa.ohio.gov](mailto:asbestoslicensing@epa.ohio.gov).

Sincerely,

Joshua S. Koch  
Manager, Business Operations Support Section  
Ohio EPA - Division of Air Pollution Control

State of Ohio  
Environmental Protection Agency  
Asbestos Program

**Asbestos Hazard Evaluation Specialist**

**Michael A Neace**




Lawhon & Associates, Inc.  
1441 King Avenue  
Columbus OH 43212

**Certification Number**    **Expiration Date**

ES36144                      3/24/22

DOB: 10/5/89  
Card not Valid if Altered



# The InService Training Network

## Asbestos Building Inspector and Management Planner Refresher Courses



### Michael Neace

has successfully completed the Asbestos Building Inspector and Management Planner Refresher Courses and passed by at least 70% the course examinations for accreditation under Section 206 of the Toxic Substance Control Act, Title II, and Indiana 326 IAC 18-2 Provided by: The InService Training Network, Inc., 705D Lakeview Plaza Blvd, Worthington, OH 43085 (614) 436-0980

Course Dates: January 20, 2021

Examination Date: January 20, 2021

Course Instructor: 

Course Location: Worthington, Ohio

Frank Rowe

Expiration Date: January 20, 2022

Certificate Numbers: ITNIR-6973 & ITNMPR-6973







Mike DeWine, Governor  
Jon Husted, Lt. Governor  
Laurie A. Stevenson, Director

3/1/2021

Joshua Rankin  
Lawhon & Associates, Inc.  
1441 King Avenue  
Columbus, OH 43212

RE: Evaluation Specialist  
Certification Number: ES36263  
Expiration Date: 3/26/2022

Dear Joshua Rankin:

This letter and enclosed certification card approves your request to be certified as an asbestos Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Ohio Environmental Protection Agency (EPA) for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please contact the Asbestos Program at 614-644-0226 or by email at [asbestoslicensing@epa.ohio.gov](mailto:asbestoslicensing@epa.ohio.gov).

Sincerely,

Joshua S. Koch  
Manager, Business Operations Support Section  
Ohio EPA - Division of Air Pollution Control

State of Ohio Environmental Protection Agency Asbestos Program	
<b>Asbestos Hazard Evaluation Specialist</b>	
<b>Joshua Rankin</b>	
Lawhon & Associates, Inc. 1441 King Avenue Columbus OH 43212	
<b>Certification Number</b>	<b>Expiration Date</b>
<b>ES36263</b>	<b>3/26/22</b>
DOB: 9/4/92 Card not Valid if Altered	



# The InService Training Network

## Asbestos Building Inspector and Management Planner Refresher Courses



**Josh Rankin**

has successfully completed the Asbestos Building Inspector and Management Planner Refresher Courses and passed by at least 70% the course examinations for accreditation under Section 206 of the Toxic Substance Control Act, Title II, and Indiana 326 IAC 18-2  
Provided by: The InService Training Network, Inc., 705D Lakeview Plaza Blvd, Worthington, OH 43085 (614) 436-0980

**Course Dates: February 10, 2021**

**Examination Date: February 10, 2021**

**Course Director:**

  
Kurt Varga

**Course Location: Worthington, Ohio**

**Expiration Date: February 10, 2022**

**Certificate Numbers: ITNIR-6993 & ITNMPR-6993**



## **APPENDIX B**

### **Asbestos Bulk Sample Location Diagram**



# Lawhon & Associates, Inc.

ENVIRONMENTAL CONSULTING AND ENGINEERING SERVICES

Columbus

Cleveland

Dayton

## Asbestos Bulk Sample Locations

Eaton Outpost

Collected on 8/24/21

Collected by Aris Neace

AHES 36144

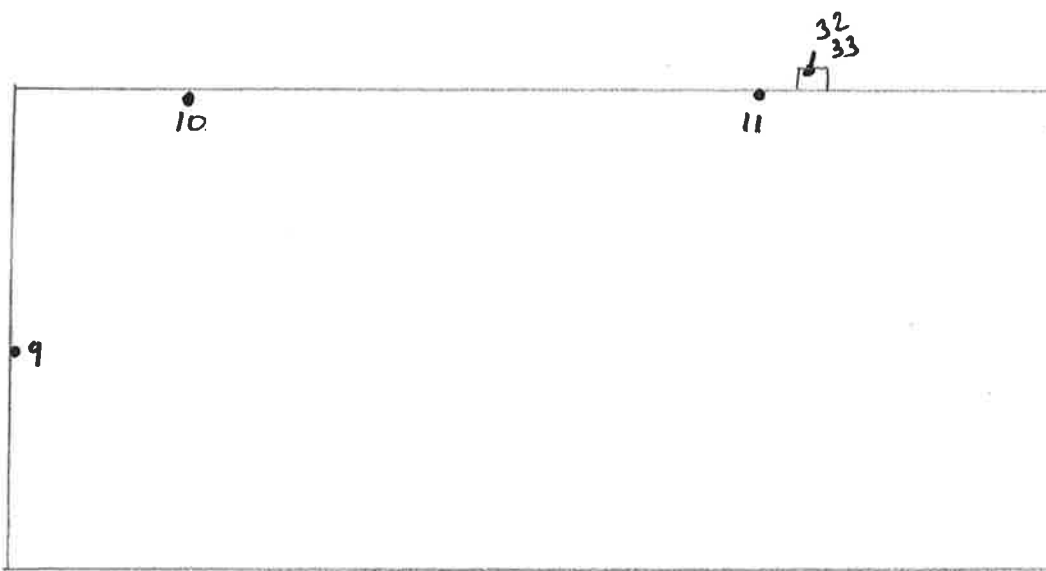
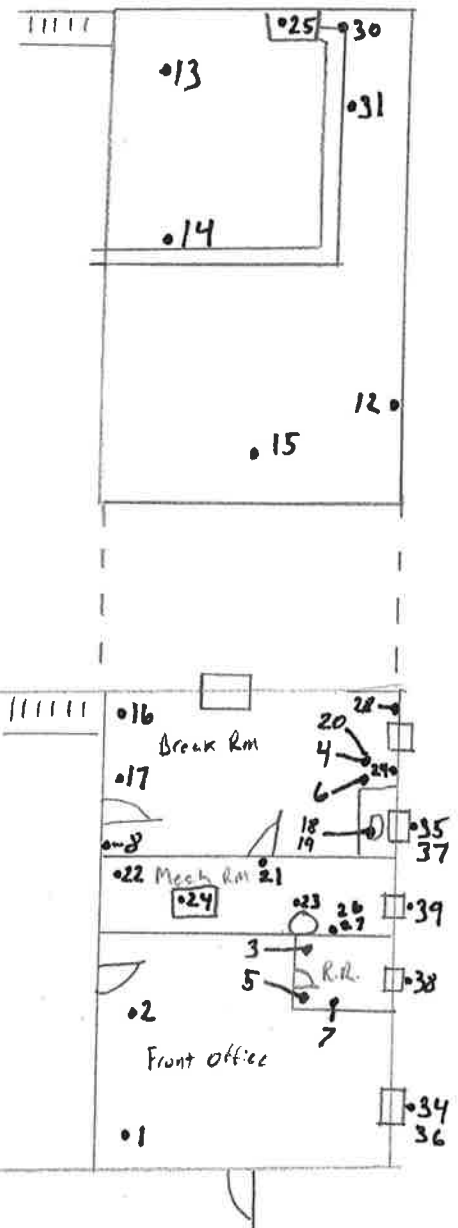
Aris Neace

Josh Rankin

AHES 36263

Josh Rankin

### 2<sup>nd</sup> Floor



## **APPENDIX C**

### **Asbestos Bulk Sample Summary**

**ASBESTOS BULK SAMPLE SUMMARY**  
**DOT-200023**  
**ODOT D8- Eaton Outpost Garage Building**  
**Eaton, Ohio 45320**

Sample Number	Hom. Area #	Material Sampled	Location	Percent Asbestos
1	1	2'x4' Ceiling Panel-Pin Hole/Large Fissure	Front Office	NAD
2	1	2'x4' Ceiling Panel-Pin Hole/Large Fissure	Front Office	NAD
3	2a	12" Orange Floor Tile	Restroom	NAD
4a	2a	12" Orange Floor Tile	Break Room	NAD
4b	2c	Tan Mastic		NAD
5	2b	12" Green Floor Tile	Restroom	NAD
6a	2b	12" Green Floor Tile	Break Room	NAD
6b	2c	Tan Mastic		NAD
7a	3a	Cove Base	Restroom	NAD
7b	3b	Glue		NAD
8a	3a	Cove Base	Break Room	NAD
8b	3b	Glue		NAD
9	4	Spray Applied Fireproofing	Ground Floor Wall	NAD
10	4	Spray Applied Fireproofing	Ground Floor Wall	NAD
11	4	Spray Applied Fireproofing	Ground Floor Wall	NAD
12	4	Spray Applied Fireproofing	Second Floor Wall	NAD
13	4	Spray Applied Fireproofing	Second Floor Ceiling	NAD
14	4	Spray Applied Fireproofing	Second Floor Ceiling	NAD
15	4	Spray Applied Fireproofing	Second Floor Ceiling	NAD
16	5	2'x4' Ceiling Panel-Pin Hole/Medium Fissure	Break Room	NAD

**Bold** text denotes an Asbestos Containing Material; as defined by EPA and OSHA

*Italic* Text denotes an Material Containing Less than 1% Asbestos; for OSHA

**Legend**

**Abbreviation:** NAD  
**Definition:** No Asbestos Detected

**Abbreviation:** PC  
**Definition:** Point Count Method

**ASBESTOS BULK SAMPLE SUMMARY**  
**DOT-200023**  
**ODOT D8- Eaton Outpost Garage Building**  
**Eaton, Ohio 45320**

Sample Number	Hom. Area #	Material Sampled	Location	Percent Asbestos
17	5	2'x4' Ceiling Panel-Pin Hole/Medium Fissure	Break Room	NAD
<b>18</b>	<b>6</b>	<b>White Sink Undercoating</b>	<b>Break Room</b>	<b>5% Chrysotile</b>
<b>19</b>	<b>6</b>	<b>White Sink Undercoating</b>	<b>Break Room</b>	<b>5% Chrysotile</b>
20a	7a	2 <sup>nd</sup> Layer Floor Tile	Break Room	NAD
20b	7b	Tan Mastic		NAD
21a	7a	2 <sup>nd</sup> Layer Floor Tile	Break Room	NAD
21b	7b	Tan Mastic		NAD
22	8	Fiberglass Pipe Insulation Sealant	Mech Room	NAD
23	8	Fiberglass Pipe Insulation Sealant	Mech Room	NAD
24	9	Vibration Dampener (Newer)	Mech Room	NAD
25	9	Vibration Dampener (Newer)	Second Floor	NAD
<b>26</b>	<b>10</b>	<b>Mudded Fitting</b>	<b>Mech Room</b>	<b>8% Chrysotile</b>
<b>27</b>	<b>10</b>	<b>Mudded Fitting</b>	<b>Mech Room</b>	<b>8% Chrysotile</b>
28a	11a	Drywall	Break Room	NAD
28b	11b	Joint Compound		NAD
29a	11a	Drywall	Break Room	NAD
29b	11b	Joint Compound		NAD
30	12	Duct Mastic	Second Floor	NAD
31	12	Duct Mastic	Second Floor	NAD
32	13	Exterior Fiberboard	Exterior Garage	NAD
33	13	Exterior Fiberboard	Exterior Garage	NAD

**Bold** text denotes an Asbestos Containing Material; as defined by EPA and OSHA

*Italic* Text denotes an Material Containing Less than 1% Asbestos; for OSHA

**Legend**

**Abbreviation:**    **Definition:**  
NAD                    No Asbestos Detected

**Abbreviation:**    **Definition:**  
PC                      Point Count Method



**ASBESTOS BULK SAMPLE SUMMARY**  
**DOT-200023**  
**ODOT D8- Eaton Outpost Garage Building**  
**Eaton, Ohio 45320**

<b>Sample Number</b>	<b>Hom. Area #</b>	<b>Material Sampled</b>	<b>Location</b>	<b>Percent Asbestos</b>
34	14	Exterior Window Putty	Front Office	NAD
35	14	Exterior Window Putty	Break Room	NAD
36	15	Exterior Window Caulk	Office	NAD
37	15	Exterior Window Caulk	Break Room	NAD
38	16	<i>Exterior Window Glazing Compound</i>	<i>Restroom</i>	<i>0.25% Chrysotile (PC)</i>
39	16	<i>Exterior Window Glazing Compound</i>	<i>Mech Room</i>	<i>0.25% Chrysotile (PC)</i>

**Bold** text denotes an Asbestos Containing Material; as defined by EPA and OSHA

*Italic* Text denotes an Material Containing Less than 1% Asbestos; for OSHA

**Legend**

**Abbreviation: Definition:**  
 NAD No Asbestos Detected

**Abbreviation: Definition:**  
 PC Point Count Method

## **APPENDIX D**

### **Inventory of Asbestos Containing Materials**

**APPENDIX E**

**Asbestos Laboratory Analysis Certificates**

**&**

**Chain of Custody**

**INVENTORY OF ASBESTOS CONTAINING MATERIALS**  
**DOT-200023**  
**ODOT D8- Eaton Outpost Garage Building**  
**Eaton, Ohio 45320**

ACM	Locations	Approximate Quantity	EPA NESHAP Classification & Comments
White Sink Undercoating	Break Room	1 sink (5sf)	Category II (probability of becoming friable)
Mudded Fitting	Mechanical Room	1 each (1lf)	RACM
Exterior Window Glazing Compound	Windows associated with the Break Room, Mechanical Room, Restroom, and Front Office	6 windows (15sf)	1% or Less Asbestos (1)
Roofing Materials (Assumed)	Roof	5,040sf	Category I Non-Friable (2)

Notes: (1) These materials contain 1% or less asbestos. EPA does not regulate these materials; however, OSHA regulations still apply. Refer to **Section 3.3 Materials Containing 1% or Less Asbestos** on Pages 3-5 of this report for more information regarding the removal/disposal of these materials.

(2) Intact Category I Non-Friable ACM may remain in the structure during routine demolition activities which will not subject the materials to sanding, grinding, etc. These materials and their substrates cannot be recycled, used for backfilling purposes or be abandoned onsite. Additionally, the C&D landfill utilized for the waste stream must be notified of its presence prior to acceptance and disposal.



**The Identification Specialists**

Analysis Report  
prepared for  
Lawhon & Associates, Inc.

**Report Date: 9/2/2021**

**Project Name: JMSA - ODOT D8 Eaton Outpost**

**Project #: 21-0374**

**SanAir ID#: 21045160**



NVLAP LAB CODE 600227-0

11709 Chesterdale Road | Cincinnati, Ohio 45246  
888.895.1177 | 513.438.6006 | [IAQ@SanAir.com](mailto:IAQ@SanAir.com) | [SanAir.com](http://SanAir.com)



SanAir ID Number  
21045160  
FINAL REPORT  
9/2/2021 5:46:35 PM

**Name:** Lawhon & Associates, Inc.  
**Address:** 1441 King Ave  
Columbus, OH 43212  
**Phone:** 614-481-8600 ext. 142

**Project Number:** 21-0374  
**P.O. Number:**  
**Project Name:** JMSA - ODOT D8 Eaton Outpost  
**Collected Date:** 8/24/2021  
**Received Date:** 8/26/2021 12:10:00 PM

Dear Josh Rankin,

We at SanAir would like to thank you for the work you recently submitted. The 41 sample(s) were received on Thursday, August 26, 2021 via FedEx. The final report(s) is enclosed for the following sample(s): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 38, 39.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

A handwritten signature in black ink, appearing to read "Matt Daigneault", is written over a light blue horizontal line.

Matthew Daigneault  
Asbestos Laboratory Manager  
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:

- 41 samples in Good condition.



SanAir ID Number

21045160

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Analyst: Poeppelman, Dustin

### Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic		Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous		
1 / 21045160-001 2'x4' CP - PH/LF - Garage Building - Front Office	Grey Fibrous Homogeneous	25% Cellulose 25% Glass	25% Perlite 25% Other		None Detected
2 / 21045160-002 2'x4' CP - PH/LF - Garage Building - Front Office	Grey Fibrous Homogeneous	25% Cellulose 25% Glass	25% Perlite 25% Other		None Detected
3 / 21045160-003 12" FT - Garage Building - Restroom	Orange Non-Fibrous Homogeneous		30% Cal. Carbonate 70% Other		None Detected
4 / 21045160-004 12" FT / Mastic - Garage Building - Break Room, Floor Tile	Orange Non-Fibrous Homogeneous		30% Cal. Carbonate 70% Other		None Detected
4 / 21045160-004 12" FT / Mastic - Garage Building - Break Room, Mastic	Tan Non-Fibrous Homogeneous		100% Other		None Detected
5 / 21045160-005 12" FT - Garage Building - Restroom	Green Non-Fibrous Homogeneous		30% Cal. Carbonate 70% Other		None Detected
6 / 21045160-006 12" FT / Mastic - Garage Building - Break Room, Floor Tile	Green Non-Fibrous Homogeneous		30% Cal. Carbonate 70% Other		None Detected
6 / 21045160-006 12" FT / Mastic - Garage Building - Break Room, Mastic	Tan Non-Fibrous Homogeneous		100% Other		None Detected
7 / 21045160-007 Cove Base / Glue - Garage Building - Restroom, Cove Base	Brown Non-Fibrous Homogeneous		100% Other		None Detected
7 / 21045160-007 Cove Base / Glue - Garage Building - Restroom, Mastic	Tan Non-Fibrous Homogeneous		100% Other		None Detected

Analyst:

Approved Signatory:

Analysis Date: 9/2/2021

Date: 9/2/2021



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Analyst: Poeppelman, Dustin

### Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic		Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous		
8 / 21045160-008 Cove Base / Glue - Garage Building - Break Room, Cove Base	Brown Non-Fibrous Homogeneous		100% Other		None Detected
8 / 21045160-008 Cove Base / Glue - Garage Building - Break Room, Mastic	Tan Non-Fibrous Homogeneous		100% Other		None Detected
9 / 21045160-009 Spray Applied Fireproofing - Garage Building - Ground Floor	Grey Fibrous Homogeneous	95% Cellulose	5% Other		None Detected
10 / 21045160-010 Spray Applied Fireproofing - Garage Building - Ground Floor	White Fibrous Homogeneous	95% Cellulose	5% Other		None Detected
11 / 21045160-011 Spray Applied Fireproofing - Garage Building - Ground Floor	White Fibrous Homogeneous	95% Cellulose	5% Other		None Detected
12 / 21045160-012 Spray Applied Fireproofing - Garage Building - Upstairs Wall	White Fibrous Homogeneous	95% Cellulose	5% Other		None Detected
13 / 21045160-013 Spray Applied Fireproofing - Garage Building - Upstairs Ceil	White Fibrous Homogeneous	95% Cellulose	5% Other		None Detected
14 / 21045160-014 Spray Applied Fireproofing - Garage Building - Upstairs Ceil	White Fibrous Homogeneous	95% Cellulose	5% Other		None Detected
15 / 21045160-015 Spray Applied Fireproofing - Garage Building - Upstairs Ceil	White Fibrous Homogeneous	95% Cellulose	5% Other		None Detected
16 / 21045160-016 2x4 CP - PH/MF - Garage Building - Break Room	Grey Fibrous Homogeneous	25% Cellulose 25% Glass	25% Perlite 25% Other		None Detected

Analyst:

Approved Signatory:

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Analyst: Poeppelman, Dustin

### Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic		Components		Asbestos Fibers
	Appearance		% Fibrous	% Non-fibrous	
17 / 21045160-017 2x4 CP - PH/MF - Garage Building - Break Room	Grey Fibrous Homogeneous		25% Cellulose 25% Glass	25% Perlite 25% Other	None Detected
18 / 21045160-018 Sink Undercoating - Garage Building - Break Room	White Non-Fibrous Homogeneous			10% Mica 85% Other	5% Chrysotile
19 / 21045160-019 Sink Undercoating - Garage Building - Break Room	White Non-Fibrous Homogeneous			10% Mica 85% Other	5% Chrysotile
20 / 21045160-020 Floor Tile / Mastic Beneath HA-2A/B/C - Garage Building - Br, Floor Tile	Tan Non-Fibrous Homogeneous			30% Cal. Carbonate 70% Other	None Detected
20 / 21045160-020 Floor Tile / Mastic Beneath HA-2A/B/C - Garage Building - Br, Mastic	Tan Non-Fibrous Homogeneous			100% Other	None Detected
21 / 21045160-021 Floor Tile / Mastic Beneath HA-2A/B/C - Garage Building - Br, Floor Tile	Tan Non-Fibrous Homogeneous			30% Cal. Carbonate 70% Other	None Detected
21 / 21045160-021 Floor Tile / Mastic Beneath HA-2A/B/C - Garage Building - Br, Mastic	Tan Non-Fibrous Homogeneous			100% Other	None Detected
22 / 21045160-022 Fiberglass Pipe Insulation Sealant - Garage Building - Mech	White Non-Fibrous Homogeneous		< 1% Glass	100% Other	None Detected
23 / 21045160-023 Fiberglass Pipe Insulation Sealant - Garage Building - Mech	White Non-Fibrous Homogeneous		< 1% Glass	100% Other	None Detected

Analyst:

Approved Signatory:

Analysis Date: 9/2/2021

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Analyst: Poeppelman, Dustin

### Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
24 / 21045160-024 Vibration Dampener (Newer) - Garage Building - Mech Rm	Various Fibrous Homogeneous	90% Glass	10% Other	None Detected
25 / 21045160-025 Vibration Dampener (Newer) - Garage Building - Upstairs	Various Fibrous Homogeneous	90% Glass	10% Other	None Detected
26 / 21045160-026 Mudded Fitting - Canvas/Mud - Garage Building - Mech Rm	Grey Non-Fibrous Homogeneous	2% Synthetic	90% Other	8% Chrysotile
27 / 21045160-027 Mudded Fitting - Canvas/Mud - Garage Building - Mech Rm	Grey Non-Fibrous Homogeneous	2% Synthetic	90% Other	8% Chrysotile
28 / 21045160-028 Drywall / Joint Compound - Garage Building - Break Rm, Drywall	Grey Non-Fibrous Heterogeneous	8% Cellulose	85% Gypsum 7% Other	None Detected
28 / 21045160-028 Drywall / Joint Compound - Garage Building - Break Rm, Joint Compound	White Non-Fibrous Homogeneous		5% Mica 10% Perlite 85% Other	None Detected
29 / 21045160-029 Drywall / Joint Compound - Garage Building - Break Rm, Drywall	Grey Non-Fibrous Heterogeneous	8% Cellulose	85% Gypsum 7% Other	None Detected
29 / 21045160-029 Drywall / Joint Compound - Garage Building - Break Rm, Joint Compound	White Non-Fibrous Homogeneous		5% Mica 10% Perlite 85% Other	None Detected
30 / 21045160-030 Duct Mastic - Garage Building - Upstairs	Brown Non-Fibrous Homogeneous		100% Other	None Detected

Analyst:

Approved Signatory:

Analysis Date: 9/2/2021

Date: 9/2/2021



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Analyst: Poeppelman, Dustin

### Asbestos Bulk PLM EPA 600/R-93/116

SanAir ID / Description	Stereoscopic		Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous		
31 / 21045160-031 Duct Mastic - Garage Building - Upstairs	Brown Non-Fibrous Homogeneous		100% Other		None Detected
32 / 21045160-032 Exterior Fiber Board - Garage Building - Exterior Garage	White Non-Fibrous Homogeneous	20% Glass	80% Other		None Detected
33 / 21045160-033 Exterior Fiber Board - Garage Building - Exterior Garage	White Non-Fibrous Homogeneous	20% Glass	80% Other		None Detected
34 / 21045160-034 Exterior Window Putty - Garage Building - Front Office	Black Non-Fibrous Homogeneous		100% Other		None Detected
35 / 21045160-035 Exterior Window Putty - Garage Building - Break Rm	Black Non-Fibrous Homogeneous		100% Other		None Detected
36 / 21045160-036 Exterior Window Caulk - Garage Building - Office	Brown Non-Fibrous Homogeneous		100% Other		None Detected
37 / 21045160-037 Exterior Window Caulk - Garage Building - Break Rm	Brown Non-Fibrous Homogeneous		100% Other		None Detected
38 / 21045160-038 Exterior Window Glazing Compound - Garage Building - Restroo	Grey Non-Fibrous Homogeneous		100% Other		< 1% Chrysotile
39 / 21045160-039 Exterior Window Glazing Compound - Garage Building - Mech Rm	Grey Non-Fibrous Homogeneous		100% Other		< 1% Chrysotile

Analyst:

Approved Signatory:

Analysis Date: 9/2/2021

Date: 9/2/2021



SanAir ID Number  
**21045160**  
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 9/2/2021 5:46:35 PM

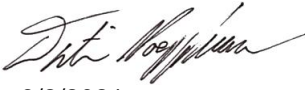
**Name:** Lawhon & Associates, Inc.  
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**Received Date:** 8/26/2021 12:10:00 PM

Analyst: Poeppelman, Dustin

### Asbestos Bulk EPA PLM 400 Point Count

SanAir ID / Description	Stereoscopic	Components		Asbestos Fibers
	Appearance	% Fibrous	% Non-fibrous	
38 / 21045160-040 Exterior Window Glazing Compound - Garage Building	Grey Non-Fibrous Homogeneous		100% Other	< 0.25% Chrysotile
39 / 21045160-041 Exterior Window Glazing Compound - Garage Building	Grey Non-Fibrous Homogeneous		100% Other	< 0.25% Chrysotile

Analyst: 

Approved Signatory: 

Analysis Date: 9/2/2021

Date: 9/2/2021

### Disclaimer

The final report cannot be reproduced, except in full, without written authorization from SanAir. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample and information provided by the client. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Samples are held for a period of 60 days.

For NY state samples, method EPA 600/M4-82-020 is performed.

Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Certifications NVLAP lab code 600227-0  
Rhode Island Certification Number: PLM00144

Point Count Friables to Job's  
FF 3% or less ACM

Sent To: San Air

VIA: FedEx

Date: 8/24/21

21045160  
No 2788

Page 1 of 3

Turn around:  
5-DAYS

## ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY RECORD

Project Name:		Project No.:	Project Contact:	Sampler (print):	Signature
MSA - ODOT D8 Eaton Outpost		21-0374	Sosh Rankin	[Signature]	[Signature]
Sample I.D. No.	Homog. Area No.	Sample / Homogeneous Area Description	Sample Location	Remarks	
1	1	2x4' CP - PH / LF	Garage Building - Front Office		
2	+	↓	- Front Office		
3	2a	12" Orange FT	- Restroom		
4	2a/2c	12" Orange FT / Mastic	- Break Room		
5	2b	12" Green FT	- Restroom		
6	2b/2c	12" Green FT / Mastic	- Break Room		
7	3a/3b	Cove Base / Glue	- Restroom		
8	↓	↓	- Break Room		
9	4	Spray Applied Fireproofing	- Ground Floor Wall		
10	↓	↓	-		
11	↓	↓	-		
12	↓	↓	- Upstairs Hall		
13	↓	↓	- Upstairs Ceiling		
14	↓	↓	-		
15	↓	↓	-		
16	5	2x4 CP - PH / MF	- Break Room		
17	↓	↓	-		

SAMPLE ANALYSIS BY EPA METHOD 600/R-93/116 UNLESS OTHERWISE NOTED.

Stop 1st Positive  Analyze All Samples

Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time
[Signature]	8/24/21 4pm	MYH 8/26/21	1210

Sent To: San Air

VIA: FedEx

Page 2 of 3

Point Count Friables & NCB's  
SF 3% or less ACM

Date: 8/24/21

Turn around: 5-DAYS

**ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY RECORD**

Project Name:		Project No.:	Project Contact:	Sampler (print):	Signature
SMSA - ODOT D8 Eaton Outpost		21-0374	Josh Rankin		
Sample I.D. No.	Homog. Area No.	Sample /Homogeneous Area Description	Sample Location	Remarks	
18	6	White Slink Undercutting	Garage Building - Break Room		
19	↓				
20	7a/b	Floor Tile/Mastic beneath HA-24/14c			
21	↓				
22	8	Fiberglass Pipe Insulation Sealant	-Mech Rm	Do Not Analyze Fiberglass	
23	↓				
24	9	Vibration Damper (newer)	- Mech Rm		
25	↓		- Upstairs		
26	10 a/b	Mudded Fitting - Canvas /mud	- Mech Rm		
27	↓				
28	11a/11b	Drywall/ Joint compound	- Break Rm	SF Positive, Composite	
29	↓				
30	12	Duct Mastic	- Upstairs		
31	↓				
32	13	Exterior Fiber Board	- Exterior Garage		
33	↓				
34	14	Exterior Window Putty	- Front Office		
35	↓		- Break Rm		

SAMPLE ANALYSIS BY EPA METHOD 600/R-93/116 UNLESS OTHERWISE NOTED.

Stop 1st Positive  Analyze All Samples

Relinquished by: (signature)	Date /Time	Received by: (signature)	Date /Time	Relinquished by: (signature)	Date /Time	Received by: (signature)	Date /Time
	8/24/21 4pm	MVH	8/26/21		12:10		

21045160  
№ 2790

Page 3 of 3

Sent To: Sent Air

VIA: FedEx

Date: 8/24/21

Point Count Variables & WOB'S  
If 3% or less ACM

Turn around: 5-DAYS

**ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY RECORD**

Project Name:		Project No.:	Project Contact:	Sampler (print):	Signature
SMSA - ODOT D8 Eaton Airport		21-0374	Josh Rankin	[Signature]	[Signature]
Sample I.D. No.	Homog. Area No.	Sample /Homogeneous Area Description	Sample Location	Remarks	
36	15	Exterior Window Caulk	Coverage Building - Office		
37	1		- Break Rm		
38	16	Exterior Window Glazing Compound	- Restroom		
39	1		- Mech Rm		
<input type="checkbox"/> Stop 1st Positive					<input checked="" type="checkbox"/> Analyze All Samples

SAMPLE ANALYSIS BY EPA METHOD 600/R-93/116 UNLESS OTHERWISE NOTED.

Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time	Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time
[Signature]	8/24/21 4pm	MYH	8/26/21		12:10		



United States Department of Commerce  
National Institute of Standards and Technology



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# Certificate of Accreditation to ISO/IEC 17025:2017

---

NVLAP LAB CODE: 600227-0

**SanAir Technologies Laboratory, Inc.**  
Cincinnati, OH

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:*

## **Asbestos Fiber Analysis**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2021-01-01 through 2021-12-31

*Effective Dates*



A handwritten signature in blue ink, reading "Tara S. Saman".

*For the National Voluntary Laboratory Accreditation Program*



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017**

**SanAir Technologies Laboratory, Inc.**

11709 Chesterdale Road

Cincinnati, OH 45246

Mr. Matthew Daigneault

Phone: 804-897-1177 Fax: 804-897-0070

Email: [mdaigneault@sanair.com](mailto:mdaigneault@sanair.com)

<https://www.sanair.com/>

**ASBESTOS FIBER ANALYSIS**

**NVLAP LAB CODE 600227-0**

**Bulk Asbestos Analysis**

<u>Code</u>	<u>Description</u>
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

**Airborne Asbestos Analysis**

<u>Code</u>	<u>Description</u>
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

A handwritten signature in blue ink, reading "Dana S. Laman".

For the National Voluntary Laboratory Accreditation Program

**APPENDIX F**  
**EPA Notification**



# Notification of Demolition and Renovation/Abatement

## Section 1: General Information

Division of Air Pollution Control

Work on projects cannot begin until 10 working days after a COMPLETE original notification form, **including payment**, is submitted to Ohio EPA. Instructions and a worksheet for fee calculation are available at [epa.ohio.gov/asbestos](http://epa.ohio.gov/asbestos). This form can be completed, and payment made, at [ebiz.epa.ohio.gov](http://ebiz.epa.ohio.gov). Questions? [asbestos@epa.ohio.gov](mailto:asbestos@epa.ohio.gov) or (614) 466-0061.

Ohio EPA Use Only	Notification #:	Postmarked: / /	Received: / /	<input type="checkbox"/> Hand-Delivered
-------------------	-----------------	-----------------	---------------	---

### 1) Notification Information (Check all that apply)

<input checked="" type="checkbox"/> Original	<input type="checkbox"/> Revision # (count):	<input type="checkbox"/> Installation	<input type="checkbox"/> Emergency	<input type="checkbox"/> Annual	<input type="checkbox"/> Cancellation	County: Preble
--	--	---------------------------------------	------------------------------------	---------------------------------	---------------------------------------	----------------

### 2) Owner, Asbestos Abatement Contractor, Billing and Fire Department Information

Revised?

Owner					
Name: ODOT District 8					Is this a company? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Address: 505 S. State Route 741			Contact Person:		
City: Lebanon		State: OH		Zip: 45036 -	
Email:		Phone: ( 513 ) 932 - 3030		Fax: ( ) -	
Asbestos Abatement Contractor (if applicable)					
Name:		License #: AC		Expiration Date: / /	
Address:			Contact Person:		
City:		State:		Zip: -	
Email:		Phone: ( ) -		Fax: ( ) -	
Billing Contact					
Is this contact associated with the <input type="checkbox"/> Owner, <input type="checkbox"/> Asbestos Abatement Contractor, or <input type="checkbox"/> Demolition Contractor (if not installation)?					
Address:			Contact Person:		
City:		State:		Zip: -	
Email:		Phone: ( ) -		Fax: ( ) -	
Fire Department (if applicable)					
Name:					
Address:			Contact Person:		
City:		State:		Zip: -	
Email:		Phone: ( ) -		Fax: ( ) -	

### 3) Ohio Asbestos Hazard Evaluation Specialist and Evaluation Procedure

Revised?

Evaluation Specialist: Aris Neace	Certification #: ES 36144	Expiration Date: 03 / 24 / 2022
Procedure, including analytical methods, employed to detect the presence of and to estimate the quantity of regulated asbestos-containing material (RACM) and Category I and Category II non-friable asbestos-containing material: <input checked="" type="checkbox"/> PLM <input checked="" type="checkbox"/> Point Count <input type="checkbox"/> TEM <input type="checkbox"/> Other Method (Explain Below):		

### 4) Procedures to be followed should unexpected RACM be discovered (check all that apply)

Revised?

<input checked="" type="checkbox"/> Stop work and keep wet	<input checked="" type="checkbox"/> Evacuate area	<input checked="" type="checkbox"/> Demarcate area	<input checked="" type="checkbox"/> Contact licensed abatement contractor
<input checked="" type="checkbox"/> Contact district office/local air authority			
<input type="checkbox"/> Other (Explain):			

### 5) Planned Demolition (check all that apply)

Revised?

Describe demolition work to be performed and method(s) to be employed, including demolition techniques to be used: <input type="checkbox"/> Implosion <input type="checkbox"/> Fire Training <input type="checkbox"/> Wet Methods <input type="checkbox"/> Manual Demolition <input type="checkbox"/> Mechanical Demolition <input type="checkbox"/> Other (Explain):
Description of affected facility components (include attachment if necessary):

# Notification of Demolition and Renovation/Abatement

## Section 1: General Information

Continued

Mail completed form and payment to:  
Ohio EPA, DAPC – Asbestos  
50 W. Town St., 7<sup>th</sup> Floor or P.O. Box 1049  
Columbus, OH 43216-1049

### 6) Asbestos Description and Engineering Controls (if asbestos is being abated)

Revised?

For the material listed in each project, describe the type(s) of ACM to be abated, engineering controls and work practices to be used to minimize emissions and ensure proper waste handling:

Type of ACM to be abated:	<input type="checkbox"/> Surfacing	<input type="checkbox"/> Mechanical	<input type="checkbox"/> Other		
Engineering Controls:	<input type="checkbox"/> Wet Methods	<input type="checkbox"/> Glove Bag	<input type="checkbox"/> NPE	<input type="checkbox"/> AFD	<input type="checkbox"/> Other:
Work Practices:	<input type="checkbox"/> Intact Removal	<input type="checkbox"/> Manual	<input type="checkbox"/> Mechanical	<input type="checkbox"/> Other:	

### 7) Asbestos Waste Transporter (if applicable)

Revised?

Transporter #1 Name:			
Address:		Contact Person:	
City:	State:	Zip:	-
Email:	Phone: ( ) -	Fax: ( ) -	
Transporter #2 Name (if applicable):			
Address:		Contact Person:	
City:	State:	Zip:	-
Email:	Phone: ( ) -	Fax: ( ) -	

### 8) Asbestos Waste Disposal Site (if applicable)

Revised?

Name:			
Address:		Contact Person:	
City:	State:	Zip:	-
Email:	Phone: ( ) -	Fax: ( ) -	

### 9) Emergency Demolition (complete if you checked "Emergency" above and "Demolition" for any project)

Revised?

A copy of the issued order, including the following information, <b>must be attached</b> to this notification.	
Government Official Issuing Order:	Title:
Agency:	Authority of Order (Citation of Code):
Date of Order: / /	Demolition Date: / /

### 10) Emergency Renovation/Abatement (complete if you checked "Emergency" above and "Renovation/Abatement" for any project)

Revised?

Date of Emergency: / /	Time of Emergency: : <input type="checkbox"/> a.m. <input type="checkbox"/> p.m.
Description of Sudden, Unexpected Event:	
Explanation of how the event caused unsafe conditions or equipment damage:	

### 11) Attestation

Revised?

In accordance with Ohio Administrative Code rule 3745-20-03(A)(4)(p), I certify that at least one person trained as required by paragraph (B) of rule 3745-20-04 of the Administrative Code will supervise the stripping and removal described by this notification. I acknowledge that the submission of false or misleading statements is prohibited by law and I certify that facts contained in this notification are true, accurate, and complete.

Signature:	Date: / /
Name:	Title:
Organization:	



# Notification of Demolition and Renovation/Abatement

## Section 2: Project Address Specific Information

Division of Air Pollution Control

Please complete Section 2 for the address included with this notification. If the project is an "Installation" per OAC 3745-20, complete a separate Section 2 page for each address associated with this notification.

Ohio EPA Use Only	Project ID #: _____
-------------------	---------------------

**A. Facility Description** Revised?

Building Name (if applicable): ODOT Eaton Outpost		Site Location (specific): Garage Building	
Address: 5656 U.S. 127		County: Preble	
City: Eaton	State: OH	Zip: 45320 -	
Building Size (square feet): 5,500	No. of Floors: 2	Age:	
Present Use: ODOT Garage Facility		Prior Use:	

**B. Type of Operation (check all that apply)** Revised?

<input checked="" type="checkbox"/> Demolition	<input type="checkbox"/> Renovation/Abatement – Type: <input type="checkbox"/> Removal <input type="checkbox"/> Repair <input type="checkbox"/> Encapsulation <input type="checkbox"/> Enclosure
--	--

**C. Asbestos Present (check one)** Revised?

<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> No, previously abated	Year Abated: _____
---	-----------------------------	--	--------------------

**D. Approximate Amount of Asbestos-Containing Materials (complete table below and Section 1 #6 if asbestos is present)** Revised?

	Material to be Removed				Material NOT to be Removed	
	RACM	Non-friable Asbestos-Containing Material		Non-friable Asbestos-Containing Material		
		Category I	Category II	Category I	Category II	
Pipes (linear feet)	1					
Surface area on other facility components (ft <sup>2</sup> )			5	5040		
Volume if length or area cannot be measured (ft <sup>3</sup> )						

**E. Asbestos Abatement Schedule and Abatement Specialist (original notification is required 10 working days prior to the start of work)** Revised?

Setup Date: / /			Abatement Date: / /			Complete Date: / /	
(Shift 1) Time start/end on site	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Abatement Specialist Name:				Certification #: AS		Expiration Date: / /	
(Shift 1) Time start/end on site	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Abatement Specialist Name:				Certification #: AS		Expiration Date: / /	

**F. Demolition Contractor (if applicable)** Revised?

Name:		
Address:		Contact Person:
City:	State:	Zip: -
Email:	Phone: ( ) -	Fax: ( ) -

**G. Demolition Schedule (original notification is required 10 working days prior to the start of work)** Revised?

Start Date: / /	Complete Date: / /
-----------------	--------------------

**H. Project Hold** Revised?

Hold Begin Date: / /	Work Resume Date: / /
----------------------	-----------------------



SECTION 003132 - GEOTECHNICAL DATA

**FOR INFORMATION ONLY**



**Resource International, Inc.**

**ODOT DISTRICT 8  
EATON OUTPOST FACILITY  
EATON, OHIO**

**GEOTECHNICAL  
INVESTIGATION REPORT**

FOR INFORMATION ONLY

*Prepared For:*  
**Jerome M. Scott Architects, Inc.  
1020 Goodale Blvd.  
Columbus, Ohio 43212**

*Prepared By:*  
**Resource International, Inc.  
6350 Presidential Gateway  
Columbus, OH 43231**

**Rii Project No. W-21-118**

**September 2021**

**Planning, Engineering, Construction Management, Technology  
6350 Presidential Gateway, Columbus, Ohio 43231  
P 614.823.4949**





**RESOURCE INTERNATIONAL, INC.**

6350 Presidential Gateway  
Columbus, Ohio 43231  
Ph: 614.823.4949

September 14, 2021

Mr. Dano Boyne, AIA, NCARB  
Jerome M. Scott Architects, Inc.  
1020 Goodale Blvd.  
Columbus, Ohio 43212

**Re: Geotechnical Investigation  
ODOT District 8  
Eaton Outpost  
Eaton, Ohio  
Rii Project No. W-21-118**

Mr. Boyne:

Resource International, Inc. (Rii) is pleased to submit this geotechnical investigation report for the above-referenced project. Engineering logs have been prepared and are attached to this report along with field and laboratory test results. This report includes recommendations for the design and construction of the proposed truck storage building at the Ohio Department of Transportation (ODOT) District 8 outpost facility located at 5656 US-127 in Eaton, Ohio.

We sincerely appreciate the opportunity to be of service to you on this project. If you have any questions concerning the geotechnical investigation or this report, do not hesitate to contact us.

Sincerely,

**RESOURCE INTERNATIONAL, INC.**

Johnatan Garcia-Ruiz  
Staff Engineer

Peyman P. Majidi, P.E.  
Project Manager

Enclosure: Geotechnical Investigation Report

**ISO 9001: 2015 QMS**

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Engineering

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Management

Technology

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## APPENDICES

Appendix I	Vicinity Map and Boring Plan
Appendix II	Description of Soil Terms
Appendix III	Boring Logs: B-1 through B-5
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## 1.0 INTRODUCTION

This report is a presentation of the geotechnical investigation performed for the design and construction of a proposed truck storage building to be constructed at the Ohio Department of Transportation (ODOT) District 8 outpost facility, located at 5656 US-127 in Eaton, Ohio. A vicinity map depicting the location of the site is provided on the boring plan in Appendix I.

Based on the project information provided, it is understood that the proposed improvements will consist of a new seven-bay heated truck storage building with wash bay and administration area with break room, work stations and a restroom. Specific structural loading and site grading information were not available at the time of this report; however, it is understood that the proposed facility will be roughly 15,000 square feet in area. It is also understood that minimal cut and fill (less than 3 feet) will be necessary to bring the site to proposed grade.

### 1.1 Existing Site Conditions

The proposed facility is located approximately 0.87 mile south of I-70 at the US 127 interchange, on the east side of US 127. The existing outpost is located in a rural area, 4.5 miles north of Eaton, Ohio. Inside the facility, paved areas and vegetated areas were observed. Piles of construction fill material were observed in the east part of the facility. Farm fields were observed on the north and south of the proposed facility. Ground surface elevations across the site generally range approximately from 1102 feet to 1105 feet mean sea level (msl).

### 1.2 Site Geology

Physiographically, the site lies within the Southern Ohio Loamy Till Plain Region. This region is characterized by relatively flat-lying silty loam till end and ground moraines. Ground moraines are deposited during the retreat of a glacier, resulting in an undifferentiated mixture of clay, silt, sand and gravel. End moraines are normally associated with ice melting that is neither advancing nor retreating for a period of time. At this project location, the end moraine deposits are associated with a boulder belt, which contains a high concentration of surface boulders.

Based on the bedrock geology and topography maps of the site, obtained from the Ohio Department of Natural Resources (ODNR), the underlying bedrock is comprised of the Upper and Lower Silurian-aged Lockport Dolomite Formation. This formation consists of variegated white to gray dolomite in mostly medium to massive beds locally containing chert in the lower portion of the unit. This unit is fossiliferous, vuggy, and is finely to coarsely crystalline and ranges from 30 to 300 feet thick. The bedrock surface forms a small rectangular-shaped plateau beneath the site, the depth to bedrock at the boring locations appears to be at an approximate elevation of 1050 feet msl or approximately 55 feet below the ground surface.

## 2.0 SUBSURFACE INVESTIGATION

On August 12, 2021, a total of five (5) borings, designated B-1 through B-5 were drilled at the locations illustrated on the boring plan provided in Appendix I. All the borings were drilled for the proposed structure and were extended to depths of 20.0 feet below the existing ground surface. Table 1 summarizes the boring program completed for this investigation.

**Table 1. Boring Reference**

Boring Number	Proposed Structure Reference	Northing	Easting	Ground Elevation (feet msl)	Boring Depth (feet)
B-1	Vehicle Storage Building & Driveway area	670990.616	1370459.620	1103.5	20.0
B-2		671002.156	1370541.931	1103.9	20.0
B-3		670992.012	1370632.159	1103.0	20.5
B-4		670957.318	1370481.030	1104.0	20.0
B-5		670956.656	1370632.730	1104.0	20.0

The boring locations were determined and field located by Rii personnel. During the field reconnaissance, Rii personnel documented the existing site conditions and mapped all boring locations. Rii utilized a handheld GPS unit to obtain northing and easting coordinates at the boring locations. Approximate ground surface elevations at the boring locations were determined using topographic information from the basemap provided by Sands Decker.

The borings were drilled using a truck-mounted rotary drilling machine, utilizing a 4.5-inch outside diameter continuous flight auger to advance the holes. Standard penetration test (SPT) and split spoon sampling was performed at 2.5-foot increments to boring termination depths. The SPT, per the American Society for Testing and Materials (ASTM) designation D1586, is conducted using a 140-pound hammer free falling 30 inches to drive a 2.0-inch outside diameter split spoon sampler 18 inches. Rii utilized a calibrated automatic drop hammer to generate consistent energy transfer to the sampler. Driving resistance is recorded on the boring logs in terms of blows per 6.0-inch interval of the driving distance. The second and third intervals are added to obtain the number of blows per foot (N). SPT blow counts aid in estimating soil characteristics used to calculate bearing capacities and settlement potential. Measured blow count ( $N_m$ ) values are corrected to an equivalent (60 percent) energy ratio,  $N_{60}$ , by the following equation. Both values are represented on boring logs presented in Appendix III.



$$N_{60} = N_m \cdot (ER/60)$$

Where:

$N_m$  = measured N value

ER = drill rod energy ratio, expressed as a percent, for the system used

The hammer for the CME-750X drill rig used for this project was calibrated on September 14, 2020 and has a drill rod energy ratio of 86.2 percent.

Hand penetrometer readings, which provide a rough estimate of the unconfined compressive strength of the soil, were reported on the boring logs in units of tons per square foot (tsf) and were utilized to classify the consistency of the cohesive soil in each layer. An indirect estimate of the unconfined compressive strength of the cohesive split spoon samples can be made from a correlation with the blow counts ( $N_{60}$ ). Please note that split spoon samples are considered to be disturbed and the laboratory determination of their shear strengths may vary from undisturbed conditions.

Upon completion of drilling, the borings were backfilled with the mixture of bentonite chips and soil cuttings generated during the drilling process. Where borings penetrated existing paved surfaces, the borings were patched with equivalent thickness of cold asphalt.

During drilling, field personnel prepared field logs showing the encountered subsurface conditions. Soil samples obtained from the drilling operation were preserved in sealed glass jars and delivered to the soil laboratory. In the laboratory, the soil samples were visually classified and select soil samples were tested as noted in Table 2.

**Table 2. Laboratory Test Schedule**

Laboratory Test	Test Designation	Number of Tests Performed
Natural Moisture Content	AASHTO T265	12
Plastic and Liquid Limits	AASHTO T89/T90	7
Gradation – Hydrometer	AASHTO T88	7
Unconfined Compression Strength Testing (Soil)	ASTM D2166	1

These tests are necessary to classify the soil according to the Ohio Department of Transportation (ODOT) classification system and to estimate engineering properties of importance in determining foundation design and construction recommendations. Results of the laboratory testing are presented in Appendix IV and, in part, on the boring logs in Appendix III. A description of the soil terms used throughout this report is presented in Appendix II.

### **3.0 SUBSURFACE PROFILE**

Interpreted engineering logs have been prepared based on the field logs, visual classification of samples and laboratory test results. Classification of the borings follows the current version of ODOT specifications for Geotechnical Explorations (SGE). The following is a summary of what was found in the test borings and what is represented on the boring logs.

#### **3.1 Surface Materials**

At the existing ground surface, all the borings encountered about 8.0 inches of topsoil, as identified by the significant presence of organics and vegetation.

#### **3.2 Subsurface Soils**

Below the surficial materials, natural cohesive materials were encountered in all five borings. The natural cohesive soils were generally described as brown to gray silt and clay, silty clay, clay and sandy silt, (ODOT A-6a, A-6b, A-7-6 and A-4a). These soils contained little coarse to fine sand and traces of fine gravel. Traces of root fibers were detected at depths of 1.0 to 2.5 feet, in all the borings drilled. These traces of root fibers were found to depths of up to 5 feet below the surface level, in borings B-1 and B-5. No granular soil was found during the investigation

The shear strength and consistency of the cohesive soils are primarily derived from the hand penetrometer values (HP). The cohesive soils encountered were ranged from soft ( $0.25 < HP \leq 0.5$  tsf) to hard ( $HP > 4.0$  tsf). The unconfined compressive strength of the cohesive soil samples tested, and as estimated from the hand penetrometer, ranged from 0.5 to over 4.5 tsf (limit of the instrument).

Natural moisture contents of the cohesive soil samples tested ranged from 12 to 27 percent. The natural moisture contents of the soil samples tested for plasticity index ranged from 3 percent below to 8 percent above their corresponding plastic limits. In general, the soils exhibited natural moisture contents estimated to range from slightly below to significantly above optimum moisture levels.

##### **3.2.1 CBR Data**

Based on the results of the laboratory classification testing performed on the split spoon samples obtained from the borings, correlated California Bearing Ratio (CBR) values were derived. The CBR is a rating of the subgrade soil that measures the load bearing capacities of the soils. The CBR values for each sample tested for classification are summarized in Table 3.

**Table 3. Estimated CBR Values**

Boring No.	Sample Depth (feet)	Soil Classification	MC	LL	PL	PI	Fines (%)	GI <sup>1</sup>	CBR <sup>1</sup>
B-1	1.0	A-6b	17	37	20	17	84	11	5
B-1	6.0	A-6a	22	27	14	13	60	6	7
B-1A	6.0	A-6b	20	34	16	18	70	10	6
B-2	6.0	A-6a	14	25	14	11	57	5	8
B-3	3.5	A-7-6	24	60	20	40	82	20	3
B-4	6.0	A-4a	13	20	13	7	52	3	9
B-5	1.0	A-7-6	27	61	19	42	82	20	3

1. GI and CBR values are based on correlation charts (Ohio Department of Transportation [ODOT] Pavement Design Manual, Figures 203-1 and 203-2).

### 3.3 Bedrock

Bedrock was not encountered in any of the borings performed for this investigation.

### 3.4 Groundwater

Groundwater was not encountered during the drilling of any of the borings. However, upon completion of the borings and removal of the augers, ground water was observed in borings B-3 and B-4 at depths ranging from 6.0 feet to 8.5 feet beneath the existing ground surface.

Please note that short-term water level readings are not necessarily an accurate indication of the actual groundwater level. In addition, groundwater levels or the presence of groundwater are considered to be dependent on seasonal fluctuations in precipitation. A more comprehensive description of the subsurface conditions encountered during the drilling program can be found on the boring logs in Appendix III..

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

Data obtained from the drilling and testing program have been used to determine foundation support capabilities and the settlement potential for the soil encountered at the site. These parameters have been used to provide guidelines for the design of the structure foundation and pavement support systems, as well as the construction specifications related to the placement of foundation and pavement systems and general earthwork recommendations, which are discussed in the following paragraphs. Allowable bearing capacity considers the gross loading, which includes weight of





foundation concrete for elements placed below the existing ground and the loading from the superstructures.

As stated, based on the project information provided, it is understood that the proposed structure will consist of new seven-bay heated truck storage building with roughly 15,000 square feet in area. Specific structural loading and site grading information were not available at the time of this report. Minimal cut and fill (less than 3 feet) was presumed.

#### 4.1 Shallow Foundation Recommendations

Based on soil conditions encountered in the borings B-1 through B-5 performed within the proposed building footprints, the materials at the anticipated bearing level consist of very stiff clay, and very stiff silt and clay (ODOT A-7-6 and A-6a). Conventional shallow foundations bearing on these competent natural soils **be proportioned for a maximum allowable bearing capacity of 3.0 ksf.**

The bearing strata should be carefully inspected as soon as possible to assure adequacy. Inadequate bearing soil (soft/loose/organic), if encountered, should be over excavated to expose the underlying competent natural soils. The over excavations may then be backfilled with either compacted engineered fill in accordance with Section 4.5 or Item 613 “Low Strength Mortar Backfill” (LSM) from the ODOT Construction and Materials Specification (CMS). If engineered fill is used, the over excavations should extend down and out from the bottom of the proposed foundation edge at 45 degree plane to remove this material from the zone of influence of the structure. If ODOT Item 613 LSM is utilized as the backfill material, then vertical excavations may be utilized.

Foundations designed in accordance with the above-noted recommendations would experience total settlements of approximately 1.75 inch and differential settlements of approximately 0.8 inches. Over excavation and replacement of approximately 3.0 feet of the clay soil found below the proposed bearing strata with a compacted granular fill (in accordance with Section 4.5) could reduce the expected total settlement about 50%.

Footing concrete should be placed as soon as possible following footing excavation, preferably the same day, to avoid potential foundation soil softening due to water related damage. Footings should be kept dry and clean until footing concrete is placed in order to minimize damage to the bearing surface.

In order to protect against frost, exterior footings (and interior footings to be subjected to freeze-thaw effects during construction) should be placed at a minimum frost depth of 36.0 inches below the adjacent exterior grade, or in accordance with local codes. Interior footings, in heated areas not subject to freeze-thaw effects, should be placed at a minimum depth of 24.0 inches below the floor slab. A minimum width of 24.0 inches for continuous and 36.0 inches for spread footings is recommended.

## 4.2 Seismic Site Classification

Based on the soil conditions at the site, as indicated by the test borings and estimated from local geological references, the seismic analysis and design procedures for the proposed structure should be based on Site Class D (stiff soil profile) per the current Ohio Building Code.

## 4.3 Slabs-on-Grade

Floor slabs should be designed and constructed as “floating” slabs that are structurally independent of building foundations. Adequate expansion joints should be incorporated into the floor slabs near the foundations so that the floor slabs do not impose additional loads on the foundations. The expansion joints would also allow the foundations and floor slabs to settle independently of each other.

Provided that the slab-on-grade is prepared in accordance with Section 4.5, **a modulus of subgrade reaction, k, of 135 pci should be used in the design of concrete floor slabs** at this site. The use of vapor barriers or capillary breaks is recommended for two reasons:

- The installation of sheet vapor barriers or capillary breaks retards moisture migration from the soil subgrade into the concrete floor slab, reducing the moisture content of the floor slab and subsequently reducing the possible problems with the adhesion of vinyl floor tile (if applicable).
- In areas where no vinyl tile will be installed, vapor barriers or granular capillary breaks will reduce the likelihood of differential shrinkage of the floor slabs that can cause floors to curl.

Therefore, per ACI specifications, it is recommended to place a 6-mil visqueen capillary break over a minimum of 6.0-inches fine aggregate below all concrete slabs.

The subgrade soils should be thoroughly proofrolled to identify any soft/wet/weak zones prior to placement of subbase stone or concrete.

## 4.4 Pavement Subgrade Recommendations

The subsurface conditions encountered at the anticipated subgrade elevation for the proposed parking areas consist of very stiff silt and clay, and clay (ODOT A-6a, and A-7-6). Based on laboratory classification of the subgrade soils, using correlation charts, the CBR value ranged from 3 to 9 with an average CBR value of 6. Based on review of the subsurface soils and Rii past experience with similar soils it is **recommended that pavement design be based on a California Bearing Ratio (CBR) value of 5**, with a

corresponding resilient modulus ( $M_R$ ) of 6,000 psi. Correlation charts indicate a modulus of subgrade reaction (K) equal to 135 pci and a soil support value (SSV) of 3.5.

As recommended previously, the subgrade soil should be thoroughly proofrolled in accordance with the recommendations presented in Section 4.5 to identify any soft, wet or weak zones prior to placement of aggregate subbase stone or pavement materials. At a minimum, the soils will likely require moisture conditioning as recommended in Section 4.5 of this report. However, if the soils continue to present evidence of deformation during the proofrolling, then it is recommended that the soils be stabilized via a 1.5-foot undercut and replacement with granular engineered fill.

Materials utilized for pavement construction should meet material and procedural details as outlined by the Ohio Department of Transportation (ODOT), the Asphalt Institute and/or the American Concrete Institute, as applicable.

Pavement design is dependent on the inclusion of adequate surface and subsurface drainage in order to maintain the compacted subgrade near optimum moisture conditions throughout the lifetime of the pavement.

Sources of borrow material, if required, should be designated in advance of construction. The material should be tested in the laboratory to verify the soil exhibits a minimum design CBR value of 5. The fill soil should be placed and compacted in accordance with the recommendations presented in Section 4.5.

#### **4.5 Construction Considerations**

The site work shall conform to the local specifications. If local specifications are not available, the latest ODOT Construction and Materials Specifications should be implemented. Site preparation should begin with general clearing, including the complete removal of all topsoil, vegetation and debris (as determined by a geotechnical engineer or an experienced soil technician), or any otherwise unsuitable materials from within the footprint of the proposed structure.

Prior to placing engineered fill, the slab-on-grade and/or pavement materials, the proposed subgrade surfaces should be thoroughly proofrolled with sufficient proofrolling apparatus (preferably a fully loaded tandem axle dump truck). A geotechnical engineer or an experienced soil technician should be present during proofrolling. Deflection, cracking or rutting of the subgrade surface during a proofroll indicates inadequate subgrade stability.

Areas of excess yielding should be stabilized using one of the following options: 1) scarifying, drying and recompacting, 2) mixing wet soil with dry soil, 3) undercutting unsuitable surficial soil and replacing it with controlled engineered fill, 4) modifying the soil by adding a chemical such as lime, cement or lime kiln dust, or 5) using a geogrid

subgrade reinforcement system in conjunction with granular fill. Other methods of subgrade stabilization are available and certainly may be effective (both physically and economically) in stabilizing the soil. The adequacy of any stabilization method should be verified through the construction of a test section. All proposed subgrade surfaces should be shaped to promote positive drainage, with a minimum slope of 2 percent or 0.25 inches per foot. Adequate drainage is necessary for maintaining the stability of the subgrade. Care should be taken during final grading so that no areas of potential ponding or standing water remain at the subgrade surface.

After materials are excavated to design grade, proper control of subgrade and new fill compaction should be performed by the geotechnical engineer and/or his/her representative. Generally, materials utilized for engineered fill should be free of waste construction debris and other deleterious materials and meet the following requirements:

- Maximum Dry Density per ASTM D698 > 110 pcf
- Liquid Limit < 40
- Plasticity Index < 15
- Organic Matter < 3 percent
- Maximum Particle Size < 3 inches
- Silt Content (between 0.075 and 0.005 mm) < 45 percent

Compacted granular fill shall meet the above specification and additionally shall have a maximum 35 percent passing the No. 200 sieve.

Underground utilities should be bedded in crushed granular stone, such as No. 57 or No. 8 stone, extending from 4.0 inches below the pipe to the springline of the pipe or 12.0 inches above the pipe for concrete and PVC pipe, respectively. The stone will serve as a leveling course and will provide a stable working platform. Compaction of backfill material within trench excavations located beneath any structure or pavement areas should be performed at no less than 98 percent of Standard Proctor using granular backfill placed in lifts no thicker than 8.0 inches.

#### **4.5.1 Groundwater Considerations**

Groundwater was not encountered during the drilling of any of the borings. However, upon completion of the borings and removal of the augers, ground water was observed in two of the five borings. If groundwater is encountered during construction, proper groundwater control should be employed and maintained to prevent disturbance to excavation bottoms consisting of cohesive soil, and to prevent the possible development of a quick or "boiling" condition where soft silts and/or fine sands are encountered. It is preferable that the groundwater level, if encountered, be maintained at least 36 inches below the deepest excavation. Any seepage or groundwater encountered during shallow excavation for the foundations of the proposed building structure should be able to be controlled by pumping from temporary sumps. Note that



determining and maintaining actual groundwater levels during construction is the responsibility of the contractor.

## **5.0 LIMITATIONS OF STUDY**

The above recommendations are predicated upon construction inspection by a qualified soil technician under the direct supervision of a professional geotechnical engineer. Adequate testing and inspection during construction are considered necessary to assure adequate construction of the structure foundations and pavement subgrade.

Our recommendations for this project were developed utilizing soil information obtained from the test borings that were made at the proposed site. At this time, we would like to point out that soil borings only depict the soil conditions at the specific locations and time at which they were made. The conditions at other locations on the site may differ from those occurring at the boring locations.

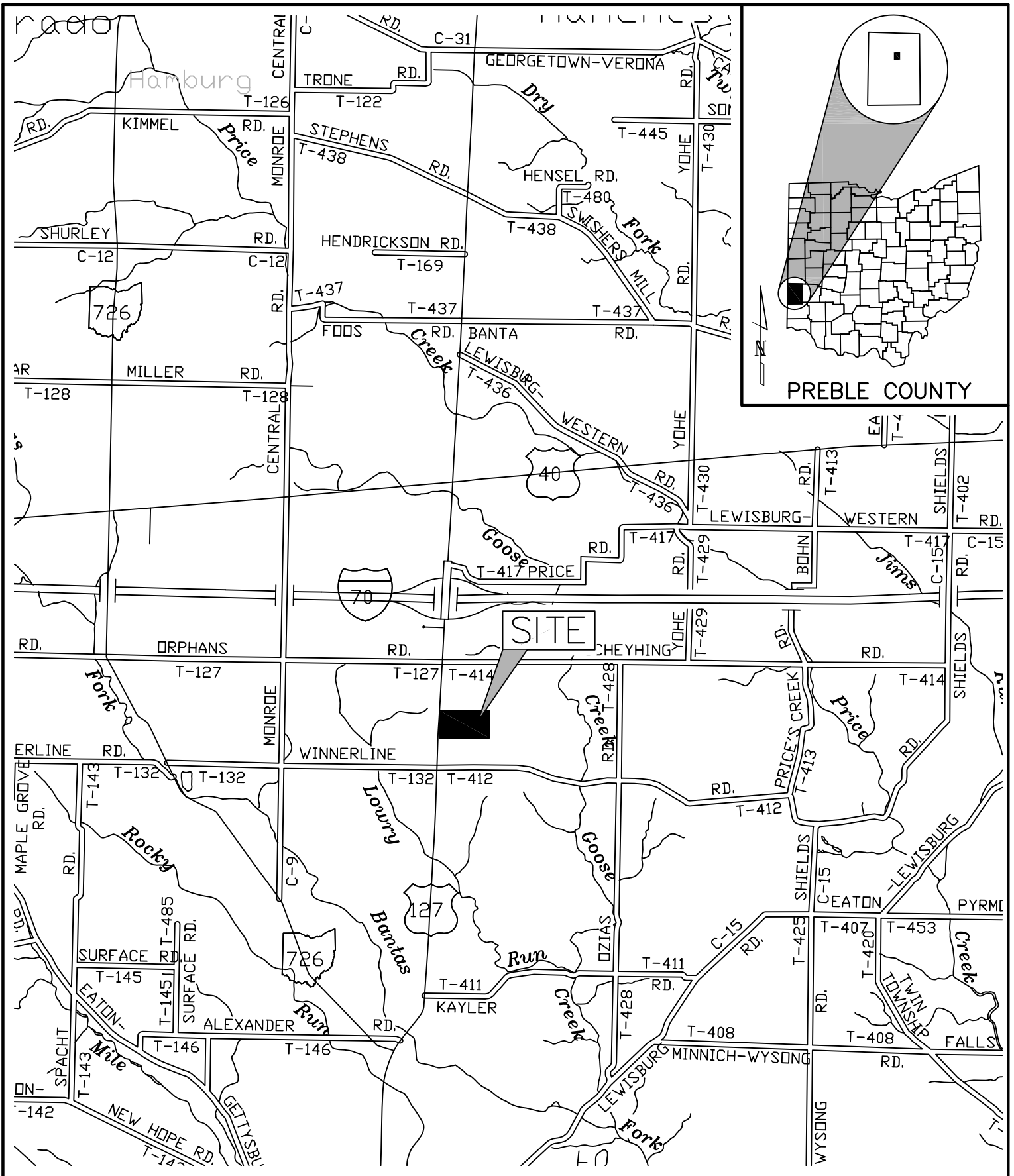
The conclusions and recommendations herein have been based upon the available soil information and the preliminary design details furnished by a representative of the owner of the proposed project. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the geotechnical engineer to determine whether any changes in the foundation or earthwork recommendations are necessary. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of the geotechnical engineer.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test boring logs regarding odors, staining of soils or other unusual conditions observed are strictly for the information of our client.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. Resource International is not responsible for the conclusions, opinions or recommendations made by others based upon the data included.

**APPENDIX I**

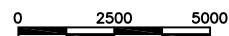
**VICINITY MAP AND BORING PLAN**



VICINITY MAP  
 ODOT DISTRICT 8  
 EATON OUTPOST FACILITY  
 EATON, OHIO

RII PROJECT NO.  
 W-21-118

SCALE: 1"=5000'



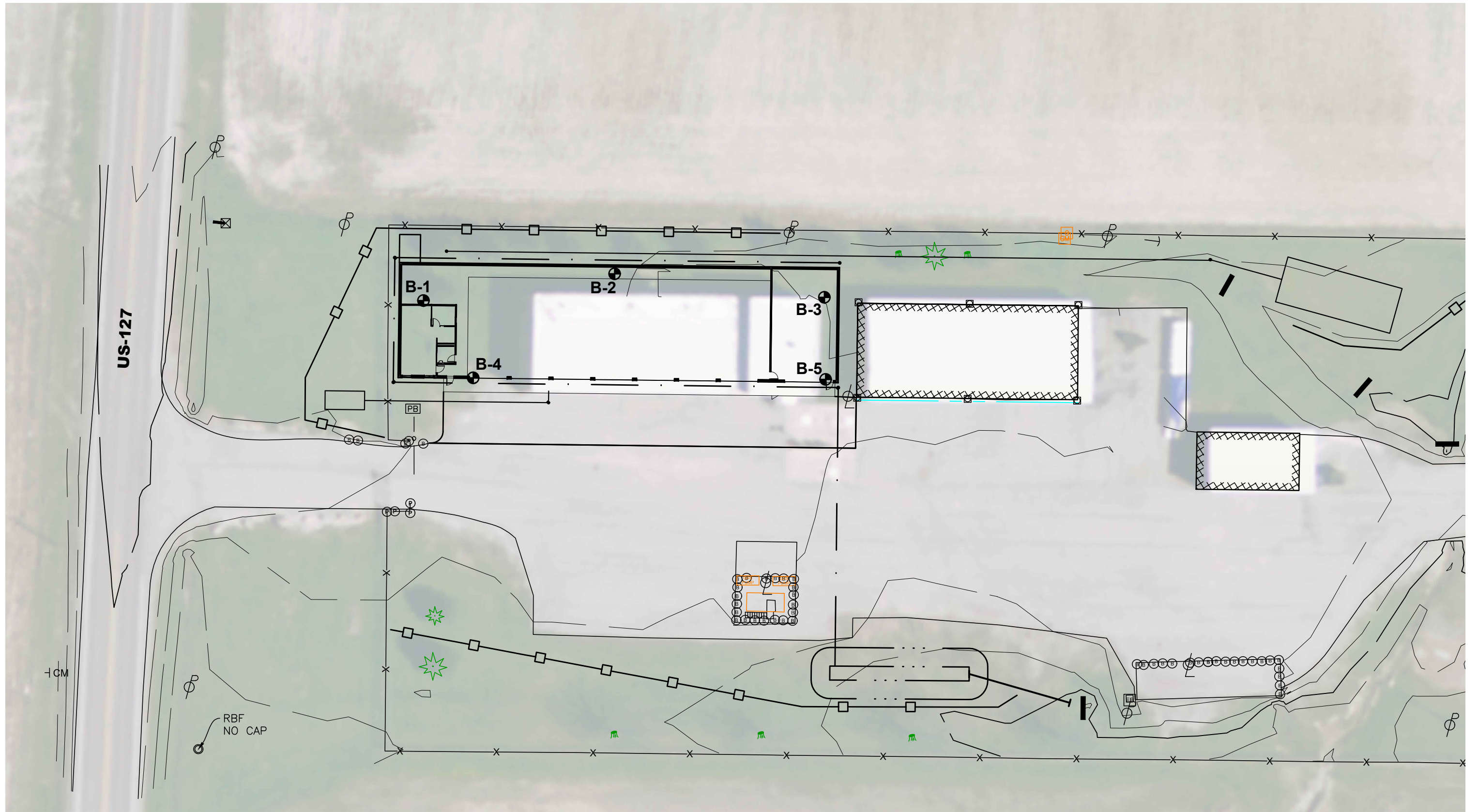
DRAWN  
 RRM

REVIEWED  
 PPM

DATE  
 9/14/2021







BORING PLAN  
 ODOT DISTRICT 8 – EATON OUTPOST FACILITY  
 EATON, OHIO

RII PROJECT NO. W-21-118	DRAWN RRM			REVIEWED PPM	
SCALE: 1"=40'	DATE 9/14/2021				



**APPENDIX II**

**DESCRIPTION OF SOIL TERMS**



# CLASSIFICATION OF SOILS

Ohio Department of Transportation

(The classification of a soil is found by proceeding from top to bottom of the chart. The first classification that the test data fits is the correct classification.)

SYMBOL	DESCRIPTION	Classification		LL <sub>O</sub> /LL × 100*	% Pass #40	% Pass #200	Liquid Limit (LL)	Plastic Index (PI)	Group Index Max.	REMARKS
		AASHTO	OHIO							
	Gravel and/or Stone Fragments	A-1-a			30 Max.	15 Max.		6 Max.	0	Min. of 50% combined gravel, cobble and boulder sizes
	Gravel and/or Stone Fragments with Sand	A-1-b			50 Max.	25 Max.		6 Max.	0	
	Fine Sand	A-3			51 Min.	10 Max.	NON-PLASTIC		0	
	Coarse and Fine Sand	--	A-3a			35 Max.		6 Max.	0	Min. of 50% combined coarse and fine sand sizes
	Gravel and/or Stone Fragments with Sand and Silt	A-2-4				35 Max.	40 Max.	10 Max.	0	
		A-2-5			41 Min.					
	Gravel and/or Stone Fragments with Sand, Silt and Clay	A-2-6				35 Max.	40 Max.	11 Min.	4	
		A-2-7			41 Min.					
	Sandy Silt	A-4	A-4a	76 Min.		36 Min.	40 Max.	10 Max.	8	Less than 50% silt sizes
	Silt	A-4	A-4b	76 Min.		50 Min.	40 Max.	10 Max.	8	50% or more silt sizes
	Elastic Silt and Clay	A-5		76 Min.		36 Min.	41 Min.	10 Max.	12	
	Silt and Clay	A-6	A-6a	76 Min.		36 Min.	40 Max.	11 - 15	10	
	Silty Clay	A-6	A-6b	76 Min.		36 Min.	40 Max.	16 Min.	16	
	Elastic Clay	A-7-5		76 Min.		36 Min.	41 Min.	≤ LL-30	20	
	Clay	A-7-6		76 Min.		36 Min.	41 Min.	> LL-30	20	
	Organic Silt	A-8	A-8a	75 Max.		36 Min.				W/o organics would classify as A-4a or A-4b
	Organic Clay	A-8	A-8b	75 Max.		36 Min.				W/o organics would classify as A-5, A-6a, A-6b, A-7-5 or A-7-6
MATERIAL CLASSIFIED BY VISUAL INSPECTION										
	Sod and Topsoil		Uncontrolled Fill (Describe)		Bouldery Zone		Peat			
	Pavement or Base									

\* Only perform the oven-dried liquid limit test and this calculation if organic material is present in the sample.

### DESCRIPTION OF SOIL TERMS

The following terminology was used to describe soils throughout this report and is generally adapted from ASTM 2487/2488 and ODOT Specifications for Geotechnical Explorations.

**Granular Soils** - The relative compactness of granular soils is described as:  
ODOT A-1, A-2, A-3, A-4 (non-plastic) or USCS GW, GP, GM, GC, SW, SP, SM, SC, ML (non-plastic)

<u>Description</u>	<u>Blows per foot – SPT (N<sub>60</sub>)</u>	
Very Loose	Below	5
Loose	5	- 10
Medium Dense	11	- 30
Dense	31	- 50
Very Dense	Over	50

**Cohesive Soils** - The relative consistency of cohesive soils is described as:  
ODOT A-4, A-5, A-6, A-7, A-8 or USCS ML, CL, OL, MH, CH, OH, PT

<u>Description</u>	<u>Unconfined Compression (tsf)</u>	
Very Soft	Less than	0.25
Soft	0.25	- 0.5
Medium Stiff	0.5	- 1.0
Stiff	1.0	- 2.0
Very Stiff	2.0	- 4.0
Hard	Over	4.0

**Gradation** - The following size-related denominations are used to describe soils:

<u>Soil Fraction</u>	<u>USCS Size</u>	<u>ODOT Size</u>
Boulders	Larger than 12"	Larger than 12"
Cobbles	12" to 3"	12" to 3"
Gravel coarse	3" to ¾"	3" to ¾"
Gravel fine	¾" to 4.75 mm (¾" to #4 Sieve)	¾" to 2.0 mm (¾" to #10 Sieve)
Sand coarse	4.75 mm to 2.0 mm (#4 to #10 Sieve)	2.0 mm to 0.42 mm (#10 to #40 Sieve)
Sand medium	2.0 mm to 0.42 mm (#10 to #40 Sieve)	-
Sand fine	0.42 mm to 0.074 mm (#40 to #200 Sieve)	0.42 mm to 0.074 mm (#40 to #200 Sieve)
Silt	0.074 mm to 0.005 mm (#200 to 0.005 mm)	0.074 mm to 0.005 mm (#200 to 0.005 mm)
Clay	Smaller than 0.005 mm	Smaller than 0.005 mm

**Modifiers of Components** - Modifiers of components are as follows:

<u>Term</u>	<u>Range</u>	
Trace	0%	- 10%
Little	10%	- 20%
Some	20%	- 35%
And	35%	- 50%

**Moisture Table** - The following moisture-related denominations are used to describe cohesive soils:

<u>Term</u>	<u>Range - USCS</u>	<u>Range - ODOT</u>
Dry	0% to 10%	Well below Plastic Limit
Damp	>2% below Plastic Limit	Below Plastic Limit
Moist	2% below to 2% above Plastic Limit	Above PL to 3% below LL
Very Moist	>2% above Plastic Limit	
Wet	≥ Liquid Limit	3% below LL to above LL

**Organic Content** – The following terms are used to describe organic soils:

<u>Term</u>	<u>Organic Content (%)</u>
Slightly organic	2-4
Moderately organic	4-10
Highly organic	>10

**Bedrock** – The following terms are used to describe the relative strength of bedrock:

<u>Description</u>	<u>Field Parameter</u>
Very Weak	Can be carved with knife and scratched by fingernail. Pieces 1 in. thick can be broken by finger pressure.
Weak	Can be grooved or gouged with knife readily. Small, thin pieces can be broken by finger pressure.
Slightly Strong	Can be grooved or gouged 0.05 in deep with knife. 1 in. size pieces from hard blows of geologist hammer.
Moderately Strong	Can be scratched with knife or pick. 1/4 in. size grooves or gouges from blows of geologist hammer.
Strong	Can be scratched with knife or pick with difficulty. Hard hammer blows to detach hand specimen.
Very Strong	Cannot be scratched by knife or pick. Hard repeated blows of geologist hammer to detach hand specimen.
Extremely Strong	Cannot be scratched by knife or pick. Hard repeated blows of geologist hammer to chip hand specimen.

**APPENDIX III**

**BORING LOGS:**

**B-1 through B-5**

# BORING LOGS

## Definitions of Abbreviations

- AS = Auger sample
- HP = Unconfined compressive strength as determined by a hand penetrometer (tons per square foot)
- LOI = Percent organic content (by weight) as determined by ASTM D2974 (loss on ignition test)
- PID = Photo-ionization detector reading (parts per million)
- QR = Unconfined compressive strength of intact rock core sample as determined by ASTM D2938 (pounds per square inch)
- QU = Unconfined compressive strength of soil sample as determined by ASTM D2166 (pounds per square foot)
- RC = Rock core sample
- REC = Ratio of total length of recovered soil or rock to the total sample length, expressed as a percentage
- RQD = Rock quality designation – estimate of the degree of jointing or fracture in a rock mass, expressed as a percentage:

$$\frac{\sum \text{segments equal to or longer than 4.0 inches}}{\text{core run length}} \times 100$$

- S = Sulfate content (parts per million)
- SPT = Standard penetration test blow counts, per ASTM D1586. Driving resistance recorded in terms of blows per 6-inch interval while letting a 140-pound hammer free fall 30 inches to drive a 2-inch outer diameter (O.D.) split spoon sampler a total of 18 inches. The second and third intervals are added to obtain the number of blows per foot (N).
- SS = Split spoon sample
- 2S = For instances of no recovery from standard SS interval, a 2.5 inch O.D. split spoon is driven the full length of the standard SS interval plus an additional 6.0 inches to obtain a representative sample. Only the final 6.0 inches of sample is retained. Blow counts from 2S sampling are not correlated with  $N_{60}$  values.
- 3S = Same as 2S, but using a 3.0 inch O.D. split spoon sampler.
- TR = Top of rock
- W = Initial water level measured during drilling
- ▼ = Water level measured at completion of drilling


### Classification Test Data

Gradation (as defined on Description of Soil Terms):

- GR = % Gravel
- SA = % Sand
- SI = % Silt
- CL = % Clay

Atterberg Limits:


- LL = Liquid limit
- PL = Plastic limit
- PI = Plasticity Index
- WC = Water content (%)

	PROJECT: W-21-118	DRILLING FIRM / OPERATOR: RII / SB	DRILL RIG: CME 750X (310218)	NORTHING: 670990.616	EXPLORATION ID <b>B-1</b>
	NAME: ODOT - DISTRICT 8 EATON OUTPOST	SAMPLING FIRM / LOGGER: RII / ET	HAMMER: AUTOMATIC	EASTING: 1370459.620	
	CLIENT: JEROME M. SCOTT ARCHITECTS INC	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 9/14/20	ELEVATION: 1103.5 ft.	PAGE 1 OF 1
	START: 8-12-21 END: 8-12-21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 86	COMPLETION DEPTH: 20.0 ft.	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
0.8' -TOPSOIL (8.5")	1103.5																	
HARD, BROWN <b>SILTY CLAY</b> , LITTLE COARSE TO FINE SAND, DAMP. -TRACE ROOT FIBERS IN SS-1	1102.7	1	1															
		2	3	10	33	SS-1	4.50	0	4	12	43	41	37	20	17	17	A-6b (11)	
	1100.5	3	4															
MEDIUM STIFF TO VERY STIFF, BROWN <b>SILT AND CLAY</b> , SOME COARSE TO FINE SAND, LITTLE FINE GRAVEL, MOIST. -TRACE ROOT FIBERS IN SS-2		4	4	16	100	SS-2	2.50	-	-	-	-	-	-	-	-	24	A-6a (V)	
		5	5	6														
		6	2															
		7	2	7	67	SS-3	0.75	11	11	18	31	29	27	14	13	22	A-6a (6)	
		8																
		9	4															
	1093.0	10	6	23	100	SS-4	4.00	-	-	-	-	-	-	-	-	-	A-6a (V)	
		11	10															
VERY STIFF TO HARD, BROWN TO GRAY <b>SILTY CLAY</b> , LITTLE COARSE TO FINE SAND, TRACE FINE GRAVEL, DAMP TO MOIST.		12	6	32	100	SS-5	4.50	-	-	-	-	-	-	-	-	-	A-6b (V)	
		13	10															
		14	6															
		15	8	24	100	SS-6	4.00	-	-	-	-	-	-	-	-	-	A-6b (V)	
		16	9															
		17	5	17	100	SS-7	4.00	-	-	-	-	-	-	-	-	-	A-6b (V)	
		18	7															
		19	3															
	1083.5	20	4	14	100	SS-8	2.50	-	-	-	-	-	-	-	-	-	A-6b (V)	
		EOB	6															

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NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING  
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

	PROJECT: W-21-118	DRILLING FIRM / OPERATOR: RII / SB	DRILL RIG: CME 750X (310218)	NORTHING: _____	<b>EXPLORATION ID</b> <b>B-1A</b>
	NAME: ODOT - DISTRICT 8 EATON OUTPOST	SAMPLING FIRM / LOGGER: RII / ET	HAMMER: AUTOMATIC	EASTING: _____	
	CLIENT: JEROME M. SCOTT ARCHITECTS INC	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 9/14/20	ELEVATION: 1103.5 ft.	PAGE 1 OF 1
	START: 8-12-21 END: 8-12-21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 86	COMPLETION DEPTH: 8.0 ft.	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
0.8' -TOPSOIL (8.5")	1103.5																	
SEE BORING B-1		1102.7																
		1097.5																
STIFF, BROWN <b>SILTY CLAY</b> , SOME COARSE TO FINE SAND, TRACE FINE GRAVEL, MOIST. -ST-1: QU = 1.1 tsf		1095.5			83	ST-1	0.50	4	8	18	33	37	34	16	18	20	A-6b (10)	
		1095.5	EOB	8														

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NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING  
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED


	PROJECT: W-21-118	DRILLING FIRM / OPERATOR: RII / SB	DRILL RIG: CME 750X (310218)	NORTHING: 671002.156	EXPLORATION ID <b>B-2</b>
	NAME: ODOT - DISTRICT 8 EATON OUTPOST	SAMPLING FIRM / LOGGER: RII / ET	HAMMER: AUTOMATIC	EASTING: 1370541.931	
	CLIENT: JEROME M. SCOTT ARCHITECTS INC	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 9/14/20	ELEVATION: 1103.9 ft.	PAGE 1 OF 1
	START: 8-12-21 END: 8-12-21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 86	COMPLETION DEPTH: 20.0 ft.	

MATERIAL DESCRIPTION AND NOTES	ELEV. 1103.9	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
0.6' -TOPSOIL (7.0")	1103.3	1	0															
STIFF TO HARD, BROWN TO BROWNISH GRAY AND GRAY <b>SILT AND CLAY</b> , SOME COARSE TO FINE SAND, LITTLE FINE GRAVEL, DAMP TO MOIST. -TRACE ROOT FIBERS IN SS-1		2	2	6	100	SS-1	1.50	-	-	-	-	-	-	-	-	-	A-6a (V)	
		3																
		4	5	6	17	100	SS-2	4.00	-	-	-	-	-	-	-	12	A-6a (V)	
		5																
		6	3	4	13	100	SS-3	3.00	11	13	19	30	27	25	14	11	14	A-6a (5)
		7																
		8																
		9	4	8	23	100	SS-4	2.00	-	-	-	-	-	-	-	-	-	A-6a (V)
		10																
		11	6	10	32	100	SS-5	4.50	-	-	-	-	-	-	-	-	-	A-6a (V)
		12																
		13																
		14	5	5	17	100	SS-6	3.00	-	-	-	-	-	-	-	-	-	A-6a (V)
		15																
		16	5	6	20	56	SS-7	2.50	-	-	-	-	-	-	-	-	-	A-6a (V)
		17																
		18																
		19	6	6	36	100	SS-8	4.50	-	-	-	-	-	-	-	-	-	A-6a (V)
		1083.9	20	19														

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NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING  
ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED




	PROJECT: W-21-118	DRILLING FIRM / OPERATOR: RII / SB	DRILL RIG: CME 750X (310218)	NORTHING: 670992.012	EXPLORATION ID <b>B-3</b>
	NAME: ODOT - DISTRICT 8 EATON OUTPOST	SAMPLING FIRM / LOGGER: RII / ET	HAMMER: AUTOMATIC	EASTING: 1370632.159	
	CLIENT: JEROME M. SCOTT ARCHITECTS INC	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 9/14/20	ELEVATION: 1103.0 ft.	PAGE 1 OF 1
	START: 8-12-21 END: 8-12-21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 86	COMPLETION DEPTH: 20.5 ft.	

MATERIAL DESCRIPTION AND NOTES	ELEV. 1103.0	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI			WC
0.7'- TOPSOIL (8.0")	1102.3	1	2															
VERY STIFF, BROWNISH GRAY <b>CLAY</b> , SOME SILT, LITTLE COARSE TO FINE SAND, TRACE FINE GRAVEL, MOIST.  -TRACE ROOT FIBERS IN SS-1	1102.3	2	2	7	56	SS-1	3.00	-	-	-	-	-	-	-	-	-	A-7-6 (V)	
		3	3															
		4	2	3	10	67	SS-2	2.50	6	2	10	33	49	60	20	40	24	A-7-6 (20)
		5	4															
	1097.0	6	2															
	1095.0	7	3	9	78	SS-3	3.00	-	-	-	-	-	-	-	-	-	A-7-6 (V)	
		8																
VERY STIFF TO HARD, GRAY <b>SILT AND CLAY</b> , LITTLE COARSE TO FINE SAND, TRACE FINE GRAVEL, DAMP TO MOIST.	1082.5	9	3	5	19	100	SS-4	4.50	-	-	-	-	-	-	-	-	13	A-6a (V)
		10	5	8														
		11	3															
		12	4	5	13	78	SS-5	4.50	-	-	-	-	-	-	-	-	-	A-6a (V)
		13																
		14	2	5	14	78	SS-6	2.50	-	-	-	-	-	-	-	-	-	A-6a (V)
		15	5	5														
		16	2															
		17	5	6	16	78	SS-7	2.50	-	-	-	-	-	-	-	-	-	A-6a (V)
		18																
		19	4	5	22	0	SS-8	-	-	-	-	-	-	-	-	-	-	
		20	12	10	-	100	2S-8A	3.50	-	-	-	-	-	-	-	-	-	A-6a (V)

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NOTES: SEEPAGE @ 11.0'; GROUNDWATER ENCOUNTERED AT COMPLETION @ 6.0'  
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED


	PROJECT: W-21-118	DRILLING FIRM / OPERATOR: RII / SB	DRILL RIG: CME 750X (310218)	NORTHING: 670957.318	EXPLORATION ID <b>B-4</b>
	NAME: ODOT - DISTRICT 8 EATON OUTPOST	SAMPLING FIRM / LOGGER: RII / ET	HAMMER: AUTOMATIC	EASTING: 1370481.030	
	CLIENT: JEROME M. SCOTT ARCHITECTS INC	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 9/14/20	ELEVATION: 1104.0 ft.	PAGE 1 OF 1
	START: 8-12-21 END: 8-12-21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 86	COMPLETION DEPTH: 20.0 ft.	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
0.7' - TOPSOIL (8.0")	1103.3	1	6															
VERY STIFF TO HARD, BROWNISH GRAY TO BROWN <b>SILT AND CLAY</b> , LITTLE COARSE TO FINE SAND, TRACE FINE GRAVEL, MOIST. -TRACE ROOT FIBERS IN SS-1	1098.5	2	9	26	67	SS-1	4.50	-	-	-	-	-	-	-	-	-	A-6a (V)	
		3																
		4	4	13	100	SS-2	2.25	-	-	-	-	-	-	-	26		A-6a (V)	
		5	5															
VERY STIFF, BROWN <b>SANDY SILT</b> , SOME CLAY, LITTLE FINE GRAVEL, MOIST.	1091.0	6	2	13	67	SS-3	3.00	12	15	21	30	22	20	13	7	13	A-4a (3)	
		7	4	5														
		8																
		9	2	14	100	SS-4	2.50	-	-	-	-	-	-	-	-	-		A-4a (V)
VERY STIFF TO HARD, GRAY <b>SILTY CLAY</b> , LITTLE COARSE TO FINE SAND, TRACE FINE GRAVEL, DAMP TO MOIST.	1084.0	10	4	6														
		11	5	7	22	100	SS-5	3.50	-	-	-	-	-	-	-	-		A-4a (V)
		12	7	8														
		13	8	10	32	100	SS-6	4.50	-	-	-	-	-	-	-	-		A-6b (V)
		14	10	12														
		15																
		16	3	5	16	100	SS-7	3.50	-	-	-	-	-	-	-	-		A-6b (V)
		17	5	6														
		18																
		19	3	4	13	100	SS-8	3.00	-	-	-	-	-	-	-	-		A-6b (V)
		20	4	5														

NOTES: SEEPAGE @ 8.5'; GROUNDWATER ENCOUNTERED AT COMPLETION @ 8.5'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

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	PROJECT: W-21-118	DRILLING FIRM / OPERATOR: RII / SB	DRILL RIG: CME 750X (310218)	NORTHING: 670956.656	EXPLORATION ID <b>B-5</b>
	NAME: ODOT - DISTRICT 8 EATON OUTPOST	SAMPLING FIRM / LOGGER: RII / ET	HAMMER: AUTOMATIC	EASTING: 1370632.730	
	CLIENT: JEROME M. SCOTT ARCHITECTS INC	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 9/14/20	ELEVATION: 1104.0 ft.	PAGE 1 OF 1
	START: 8-12-21 END: 8-12-21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 86	COMPLETION DEPTH: 20.0 ft.	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N <sub>60</sub>	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG			WC	ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI			
0.7' -TOPSOIL (8.0")	1103.3	1	3															
VERY STIFF, BROWNISH GRAY <b>CLAY</b> , SOME SILT, LITTLE COARSE TO FINE SAND, TRACE FINE GRAVEL, MOIST.  -TRACE ROOT FIBERS IN SS-1 AND SS-2	1103.3	2	3 4	10	78	SS-1	4.00	2	4	12	30	52	61	19	42	27	A-7-6 (20)	
		3																
		4	3 4	11	100	SS-2	3.00	-	-	-	-	-	-	-	-	-	-	A-7-6 (V)
STIFF TO HARD, DARK BROWN TO GRAY <b>SILT AND CLAY</b> , LITTLE COARSE TO FINE SAND, TRACE FINE GRAVEL, DAMP.	1098.5	5	4 4															
	1098.5	6	4 5	14	100	SS-3	4.50	-	-	-	-	-	-	-	-	11	A-6a (V)	
		7																
		8																
		9	3 3	13	100	SS-4	2.00	-	-	-	-	-	-	-	-	-	A-6a (V)	
		10		6														
		11	2 4	14	83	SS-5	3.50	-	-	-	-	-	-	-	-	-	A-6a (V)	
		12		6														
		13																
		14	2 6	20	100	SS-6	4.50	-	-	-	-	-	-	-	-	-	-	A-6a (V)
15		8																
16																		
17	4 5	19	100	SS-7	4.00	-	-	-	-	-	-	-	-	-	-	A-6a (V)		
18		8																
19	4 7	22	100	SS-8	3.50	-	-	-	-	-	-	-	-	-	-	A-6a (V)		
	1084.0	20	4 8															

00-2021 ODOT GENERAL NORTH EAST - OH DOT.GDT - 9/14/21 18:03 - U:\GIS\PROJECTS\2021\W-21-118.GPJ

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING  
 ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

**APPENDIX IV**

**LABORATORY TEST RESULTS**



6350 Presidential Gateway  
 Columbus, Ohio 43231  
 Telephone: (614) 823-4949  
 Fax Number: (614) 823-4990

# UNCONFINED COMPRESSION

ASTM D2166

PROJECT ODOT Eaton Outpost  
 JOB No. W-21-118

BORING B-1A  
 STATION / OFFSET \_\_\_\_\_  
 SAMPLE No. / DEPTH ST-1 / 7.4' - 7.9'  
 DATE OF TESTING 08/31/2021  
 TESTED BY K. Sarven

Soil Description: Brown Silty Clay, some coarse to fine sand, trace fine gravel, moist.  
 Soil Classification: ODOT A-6b

Physical Characteristics	L.L.	P.L.	P.I.	Gravel%	C. Sand%	F. Sand%	Silt%	Clay%
	34	16	18	3.6	8.5	17.8	32.9	37.2

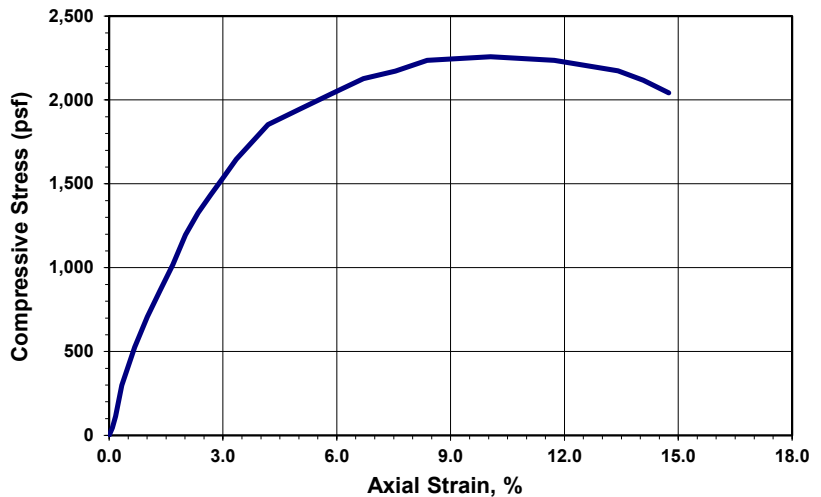
DIAMETER, D <sub>0</sub>	<u>2.822</u> in	<u>71.7</u> mm	STRAIN RATE	<u>1.00</u> %/min
AREA, A <sub>0</sub>	<u>6.253</u> in <sup>2</sup>	<u>40.3</u> cm <sup>2</sup>	WET SOIL + PAN MASS	<u>1376.8</u> g
HEIGHT, L <sub>0</sub>	<u>5.967</u> in	<u>151.55</u> mm	PAN MASS	<u>103.4</u> g
VOLUME, V <sub>0</sub>	<u>37.311</u> in <sup>3</sup>	<u>611.41</u> cm <sup>3</sup>	DRY SOIL + PAN MASS	<u>1162.1</u> g
MACH. RATE	<u>0.060</u> in/min		WET DENSITY	<u>130.02</u> lb/ft <sup>3</sup>
WATER CONT.	<u>20.28</u> %		DRY DENSITY	<u>108.10</u> lb/ft <sup>3</sup>

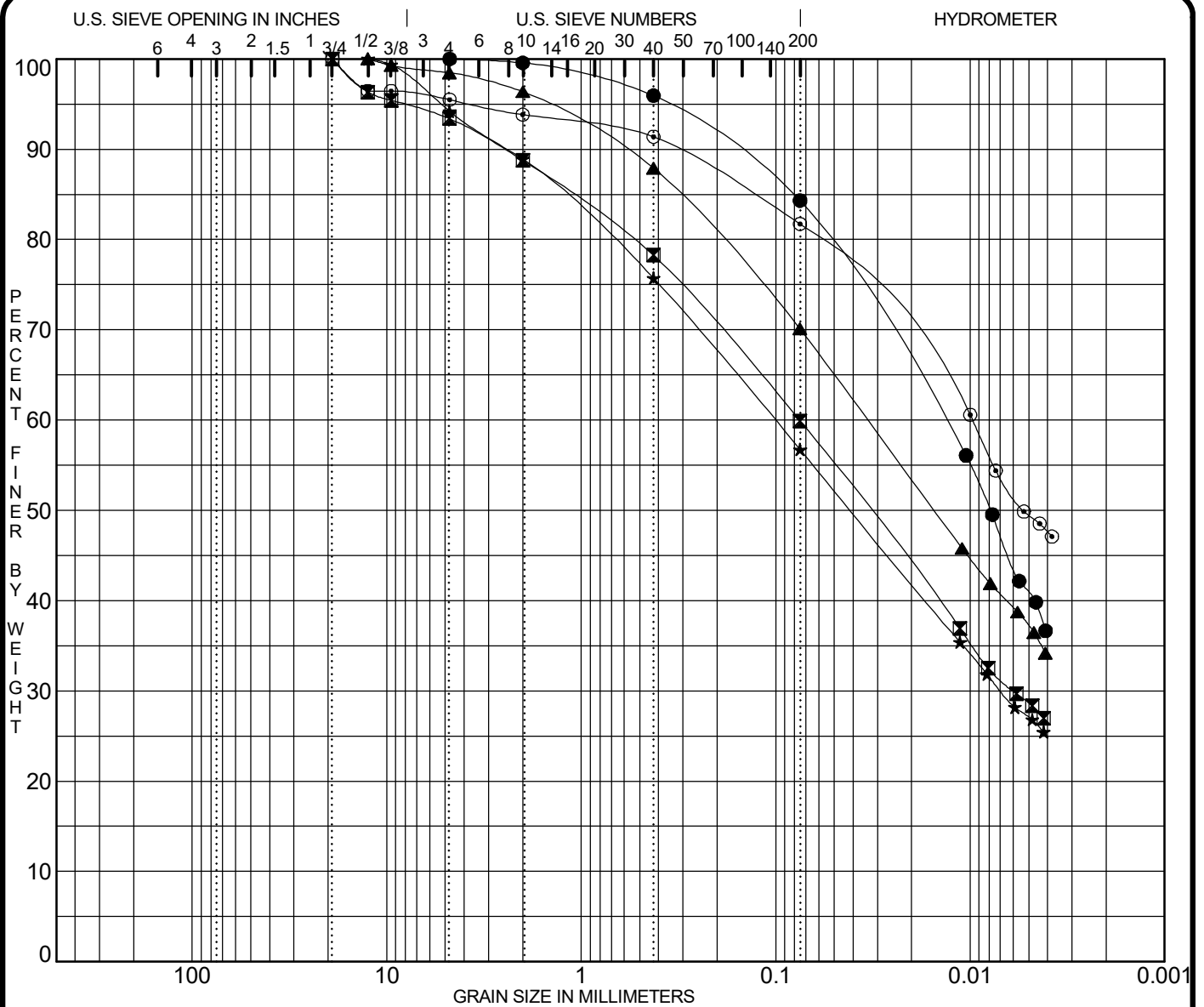
UNCONFINED COMPRESSION STRESS, q <sub>u</sub>	<b>2,258</b> psf	<u>1.13</u> tsf
AXIAL STRAIN @ FAILURE		<u>10.06</u> %
HAND PENETROMETER		<u>0.50</u> tsf

Failure Sketch



Unconfined Compression Test





COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification				MC%	LL	PL	PI	Cz	Cu
● B-1	1.0	A-6b				17	37	20	17		
⊠ B-1	6.0	A-6a				22	27	14	13		
▲ B-1A	6.0	A-6b				20	34	16	18		
★ B-2	6.0	A-6a				14	25	14	11		
⊙ B-3	3.5	A-7-6				24	60	20	40		

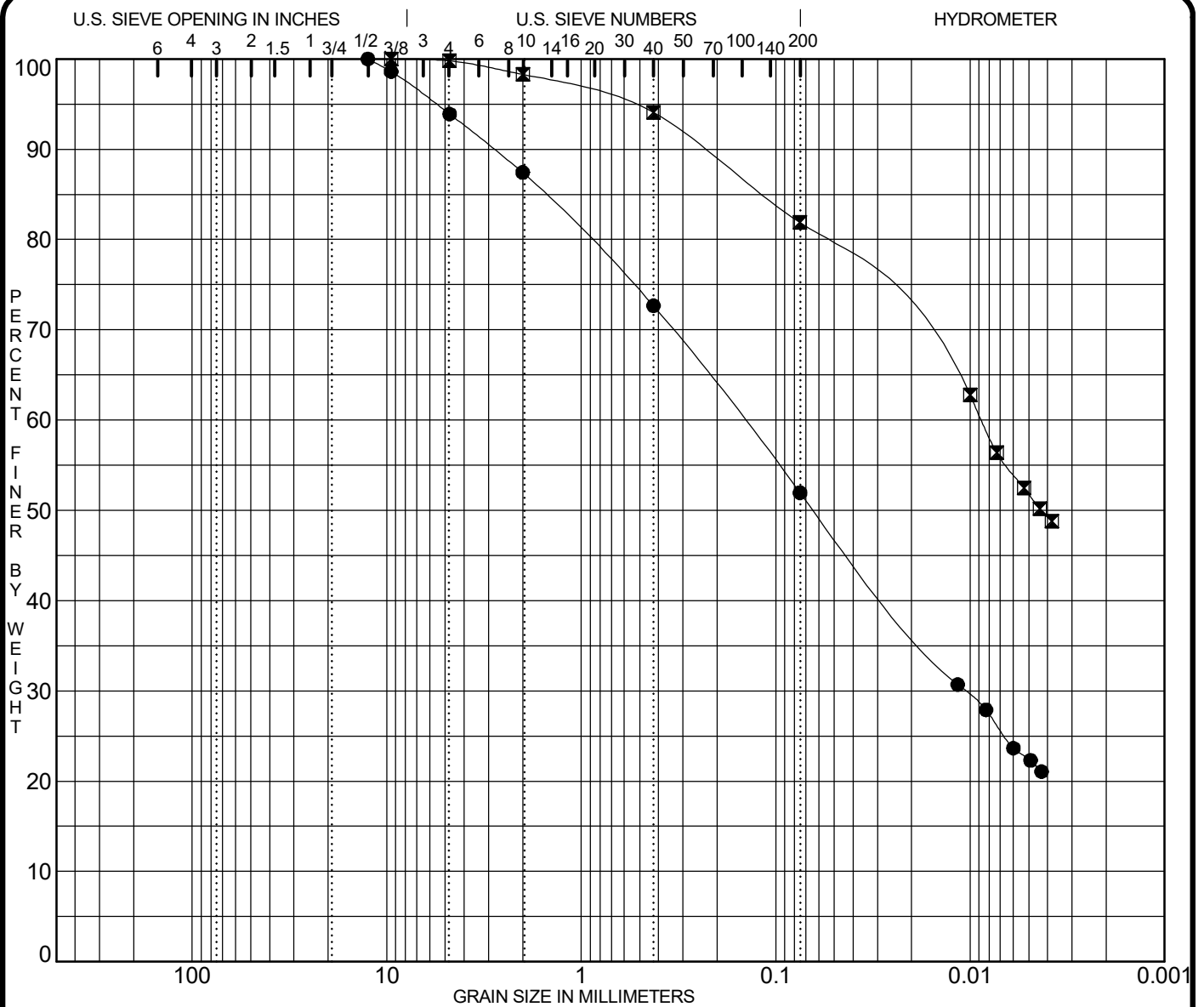
  

Specimen Identification	D60	D50	D30	D10	%Gravel		%Sand		%Silt	%Clay
					coarse	fine	coarse	fine		
● B-1	0.083	0.008			0.0	0.4	3.6	11.6	43.5	40.8
⊠ B-1	1.145	0.033	0.006		0.0	11.2	10.5	18.3	31.3	28.6
▲ B-1A	0.320	0.015			0.0	3.6	8.5	17.8	32.9	37.2
★ B-2	1.261	0.041	0.007		0.0	11.1	13.2	19.0	29.7	27.1
⊙ B-3	0.135	0.005			0.0	6.2	2.4	9.7	32.3	49.4

PROJECT ODOT - DISTRICT 8 EATON OUTPOST PROJECT NO. W-21-118

### GRADATION CURVES

Resource International



COBBLES	GRAVEL		SAND		SILT OR CLAY
	coarse	fine	coarse	fine	

Specimen Identification	Depth	Classification				MC%	LL	PL	PI	Cz	Cu
● B-4	6.0	A-4a				13	20	13	7		
☒ B-5	1.0	A-7-6				27	61	19	42		
Specimen Identification	D60	D50	D30	D10	%Gravel coarse fine	%Sand coarse fine	%Silt		%Clay		
● B-4	1.550	0.063	0.011		0.0 12.6	14.8 20.7	29.5		22.4		
☒ B-5	0.117	0.004			0.0 1.7	4.2 12.2	30.1		51.8		

PROJECT ODOT - DISTRICT 8 EATON OUTPOST

PROJECT NO. W-21-118

### GRADATION CURVES

Resource International

# Document 00 41 13 - Bid Form (General Contract / Electronic Bid)

## State of Ohio Standard Requirements for Public Facility Construction

THIS SAMPLE BID FORM IS PROVIDED WITH THE PROJECT MANUAL AS A PLACEHOLDER ONLY – SUBMIT YOUR BID USING THE ELECTRONIC BID FORM ON [HTTPS://BIDEXPRESS.COM](https://bidexpress.com)

General Info	Alt Total:	Bid Total:
<p><b>Deadline</b> 02/14/2022 2:00 PM EST</p> <p><b>Advertised</b> 12/22/2021</p> <p><b>Number</b> DOT-200023</p> <p><b>Business Name</b> Ohio Facilities Construction Commission</p>	<p><b>Description</b> ODOT – Eaton Outpost, 5656 US-127, Eaton, Ohio 45320</p>	

**Procurement Documents**

[DOT-200023\\_Bid Advertisement](#)  
→ Public Bid Advertisement

[DOT-200023\\_00 10 00 Solicitation](#)  
→ Notice to Bidders

[2021.12.17\\_BA\\_Spec](#)  
→ Procurement & Contracting Requirements and Specifications

[2021.12.17\\_BA\\_Drawings](#)  
→ Plans, elevations, sections, details, and schedules

«4» Attachments

**Contract Times and Addenda**

**Contract Times**  
The time for Substantial Completion of all Work is 225 consecutive days from the Notice to Proceed.

**Acknowledgement of receipt of Addenda**

Date Addendum #1 Received	Date Addendum #2 Received	Date Addendum #3 Received	Date Addendum #4 Received

**Allowance Instructions**

Allowance amounts are fixed and no entry of data is required by the Bidder. Include each and every Allowance amount in the Base Bid. The Bidder's Fee (overhead and profit) and costs for unloading and handling on the Site, labor, installation costs, and other expenses contemplated for the Allowance must be included in the Base Bid and NOT in the Allowance amount.



<span style="font-size: 1.2em;">■</span> Allowances (General Contract)			
Item	Description	Allowance Amount*	Extension
Allowance A-1	NWOSS Security System	\$19,500.00	\$19,500.00
Allowance A-2	Electrical Aid to Construction	\$60,000.00	\$60,000.00
2 Items		<b>Total:</b>	\$79,500.00

**■ Base Bid Instructions**

Enter the amount of the Base Bid for ALL LABOR AND MATERIALS to complete the scope of Work. Include the amount of each Allowance (if applicable) and the subtotal of each Unit Price Extension (if applicable) in the Base Bid amount. Failure to include Allowance or Unit Price Extensions in the Base Bid is the responsibility of the Bidder and will not be sufficient reason for adjustment of the Bid amount after the Bid deadline. Do not include Alternates (if applicable) in the Base Bid amount.

<span style="font-size: 1.2em;">■</span> Base Bid (General Contract)			
Item	Description	Base Bid Amount*	Extension
Base Bid	All Labor and Materials (include Allowances and Unit Price Extensions above)	_____	
1 Item		<b>Total:</b>	

**■ Alternate Instructions**

Enter the amount of each and every Alternate to ADD TO or DEDUCT FROM the Base Bid. Indicate amounts to DEDUCT FROM the Base Bid by entering a minus sign (-) before the amount entered. Do not include Alternate amounts in the Base Bid.

<span style="font-size: 1.2em;">■</span> Alternates (General Contract)			
Item	Description	Alternate Amount*	Extension
<span style="color: blue;">! Alternate: Owner-agency may award independently from entire bid.</span>			
<span style="color: blue;">! Alternates are not included in bid total.</span>			
Alternate 1	Wash Bay Overhead Door	_____	
Alternate 2	Asphalt Shingle Roof	_____	
Alternate 3	Truck Storage Interior Wall/Ceiling Finish	_____	
3 Items		<b>Alternate Total:</b>	<b>Total:</b>

**■ Bidder Affirmation and Disclosure**

The Bidder acknowledges that by submitting its Bid, the Bidder affirms, understands, and will abide by the requirements of Executive Order 2019-12D. If awarded a Contract, the Bidder will become the Contractor and affirms that both the Contractor and its Subcontractors shall perform no services requested under this Contract outside of the United States.

The Bidder shall provide the locations where services under this Contract will be performed in the spaces provided below or by attachment. Failure to provide this information as part of its Bid may cause the Bidder to be deemed non-responsive and no further consideration will be given to its Bid. If the Bidder will not be using Subcontractors, indicate "Not Applicable" in the appropriate spaces.

<b>1. Principal business location of Contractor</b>			
<b>Address*</b> <input style="width: 95%;" type="text"/>	<b>City*</b> <input style="width: 95%;" type="text"/>	<b>State*</b> <input style="width: 95%;" type="text"/>	<b>Zip*</b> <input style="width: 95%;" type="text"/>
<b>2. Locations where services will be performed by Contractor and Subcontractor (Project Sites)</b>			
<b>Address*</b> <input style="width: 95%;" type="text"/>	<b>City*</b> <input style="width: 95%;" type="text"/>	<b>State*</b> <input style="width: 95%;" type="text"/>	<b>Zip*</b> <input style="width: 95%;" type="text"/>
<b>3. Location where state data will be accessed, tested, maintained, or backed-up by Contractor</b>			
<b>Address*</b> <input style="width: 95%;" type="text"/>	<b>City*</b> <input style="width: 95%;" type="text"/>	<b>State*</b> <input style="width: 95%;" type="text"/>	<b>Zip*</b> <input style="width: 95%;" type="text"/>
<b>Locations where state data will be accessed, tested, maintained, or backed-up by Subcontractors if known at time of Bid deadline</b>			
<b>Address</b> <input style="width: 95%;" type="text"/>	<b>City</b> <input style="width: 95%;" type="text"/>	<b>State</b> <input style="width: 95%;" type="text"/>	<b>Zip</b> <input style="width: 95%;" type="text"/>

**EDGE Program Commitment to Participate**

**Option A**

The Bidder commits to meet or exceed the advertised EDGE Participation Goal of the Contract award amount, calculated as a portion of the Base Bid plus all accepted Alternates, by using EDGE-certified Business(es).

The Bidder agrees that if selected for consideration of the Contract, it shall provide (if not provided with the Bidder's Bid) to the Contracting Authority, at the location required and within 3 business days after receiving notice from the Contracting Authority, its fully-completed Bidder's Qualification Form, including an EDGE Affidavit form for each EDGE-certified Business proposed for use by the Bidder if awarded the Contract for this Project.

**Option B (indicate percentage of participation below)**

The Bidder declares that it does not meet the advertised EDGE Participation Goal percentage, but, if awarded the Contract for this Project, commits to provide the percentage of the Contract award amount, indicated above, calculated as a portion of the Base Bid plus all accepted Alternates, by using EDGE-certified Business(es).

The Bidder acknowledges it understands the requirement for it to provide and agrees to provide to the Contracting Authority, if selected for consideration of the Contract, within 3 business days after notice from the Contracting Authority, a detailed Demonstration of Good Faith form describing its efforts undertaken prior to submitting its Bid to meet the advertised EDGE Participation Goal percentage for the Contract for this Project.

The Bidder commits to provide to the Contracting Authority at the location required, and within 3 days after receiving notice from the Contracting Authority, its fully-completed Bidder's Qualifications Form, including an EDGE Affidavit form for each EDGE-certified Business proposed for use by the Bidder if awarded the Contract for this Project.

**Option C**

The Bidder declares that the Bidder is an EDGE-certified Business and that if awarded this Contract, the EDGE Participation percentage will be 100 percent of the Contract award amount.

**Select EDGE option above\***

**If option B selected, enter percentage**

## ■ Certifications (State Prevailing Wages)

1. The Bidder has read and understands the proposed Contract Documents and agrees to comply with all requirements of the proposed Contract Documents, regardless of whether the Bidder has actual knowledge of the requirements and regardless of any statement or omission made by the Bidder, which might indicate a contrary intention.
2. The Bidder represents that the Bid is based upon the Basis of Design and Acceptable Components specified by the proposed Contract Documents.
3. The Bidder has visited the Site, become familiar with local conditions, and has correlated personal observations about the requirements of the proposed Contract Documents. The Bidder has no outstanding questions regarding the interpretation or clarification of the proposed Contract Documents.
4. The Bidder understands that the execution of the Project will require sequential, coordinated, and interrelated operations, which may involve interference, disruption, hindrance, or delay in the progress of the Bidder's Work. The Bidder agrees that the Contract Sum, as amended from time to time, shall cover all amounts due from the State resulting from interference, disruption, hindrance, or delay that is not caused by the State or its agents and employees. The Bidder agrees that any such interference, disruption, hindrance, or delay is within the contemplation of the Bidder and the State and that the Contractor's sole remedy from the State for any such interference, disruption, hindrance, or delay shall be an extension of time in accordance with the proposed Contract Documents.
5. During the performance of the Contract, the Bidder agrees to comply with Ohio Administrative Code ("OAC") Chapters 123:2-3 through 123:2-9 and agrees to incorporate the monthly reporting provisions of OAC Section 123:2-9-01 into all subcontracts on the Project, regardless of tier. The Bidder understands the State's Equal Opportunity Coordinator or the Contracting Authority may conduct pre-award and post-award compliance reviews to determine if the Bidder maintains nondiscriminatory employment practices, maintains an affirmative action program, and is exerting good faith efforts to accomplish the goals of the affirmative action program. For a full statement of the rules regarding Equal Employment Opportunity in the Construction Industry, see OAC Chapters 123:2-1 through 123:2-9.
6. The Bidder and each Person submitting a Bid on behalf of the Bidder certifies, and in the case of a Bid by a joint venture each member thereof certifies as to such member's entity, under penalty of perjury, that to the best of the undersigned's knowledge and belief: (a) the Base Bid, any Unit Prices, and any Alternate bid in the Bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition as to any matter relating to such Base Bid, Unit Prices or Alternate bid with any other Bidder; (b) unless otherwise required by law, the Base Bid, any Unit Prices and any Alternate bid in the Bid have not been knowingly disclosed by the Bidder and shall not knowingly be disclosed by the Bidder prior to the bid opening, directly or indirectly, to any other Bidder who would have any interest in the Base Bid, Unit Prices, or Alternate bid; (c) no attempt has been made or shall be made by the Bidder to induce any other Person to submit or not to submit a Bid for the purpose of restricting competition.
7. The Bidder shall execute the Agreement with the Contracting Authority, if a Contract is awarded on the basis of this Bid, and if the Bidder does not execute the Agreement for any reason, other than as authorized by law, the Bidder and the Bidder's Surety are liable to the State as provided in Article 5 of the Instructions to Bidders.
8. The Bidder certifies that upon the award of a Contract, as the Contractor it shall make a good faith effort to ensure that all of the Contractor's employees, while working on the Site, shall not purchase, transfer, use, or possess illegal drugs or alcohol or abuse prescription drugs in any way.
9. The Bidder acknowledges that it read all of the Instructions to Bidders, and in particular, Section 2.10 - Submittals With Bid Form, and by submitting its Bid certifies that it has read the Instructions to Bidders and it understands and agrees to the terms and conditions stated in them.
10. The Bidder agrees to furnish any information requested by the Contracting Authority or the Architect/Engineer to evaluate the responsibility of the Bidder.
11. The Bidder agrees to furnish the submittals required by Section 6.1 of the Instructions to Bidders for execution of the Agreement within 10 days of the date of the Notice of Intent to Award.
12. When the Bidder is a corporation, partnership or sole proprietorship, an officer, partner or principal of the Bidder, as applicable, shall enter the legal name of the Bidder and the name of the officer, partner or principal of the Bidder (in lieu of signing the Bid Form) in the data fields provided.
13. When the Bidder is a joint venture, an officer, partner or principal, as applicable, of each member of the joint venture shall enter the legal name of the applicable member and the name of the officer, partner or principal (in lieu of signing the Bid Form) in the data fields provided.
14. The Bidder understands that the Contract is subject to all the provisions, duties, obligations, remedies and penalties of Ohio Revised Code Chapter 4115 and that the Bidder shall pay any wage increase in the locality during the term of the Contract.
15. The Bidder represents that the individual that is submitting and digitally signing the electronic Bid is legally authorized to do so.
16. Bidder acknowledges that by the act of submitting an electronic Bid that it is digitally signing the actual Bid, which shall serve as the Bidder's authorization for the further consideration and activity in the bidding and contract process.

The Bidder hereby acknowledges that the above representations in this Bid are material and not mere recitals.\*

**■ Procurement Forms**

[Document 00 43 13 - Bid Security Form](#)  
→ Upload below and provide original document within 3 days

[Document 00 45 13 - Bidder's Qualifications](#)  
→ Upload below or provide within 3 days of request

[Document 00 45 39 - EDGE Affidavit](#)  
→ Upload below or provide within 3 days of request

3 Attachments

**■ Instructions for Providing Bid Submittals**

**Submission of Electronic Facsimile of Bid Guaranty with Electronic Bid**  
The Bidder SHALL UPLOAD and ATTACH TO ITS BID an ELECTRONIC FACSIMILE (scanned PDF document) OF ITS BID GUARANTY, payable to the Contracting Authority, in the form of either: (1) the signed and sealed Document 00 43 13 - "Bid Security Form" contained in the Contract Documents (and provided for the Bidder's convenience in the block above) for the amount of the Base Bid plus all additive Alternates; or (2) a certified check, cashier's check, or letter of credit, for 10 percent of the Base Bid, plus all additive Alternates – a letter of credit shall expressly provide that it is revocable only by the Contracting Authority. Refer to Sections 2.10.1.1 and 5.1 of Document 00 21 13 - "Instructions to Bidders."

**Submission of Original Bid Guaranty**  
In addition to the Electronic Facsimile above, the Bidder SHALL DELIVER ITS ORIGINAL UNALTERED BID GUARANTY to the Project Coordinator at the address identified below WITHIN 3 BUSINESS DAYS AFTER THE BID DEADLINE as provided in Ohio Administrative Code Section 153:1-8-01(H). THIS REQUIREMENT APPLIES TO ALL BIDDERS. Refer to Section 2.10.1.2 of the Instructions to Bidders.

[Moenique Morris](#)  
[Ohio Facilities Construction Commission](#)  
[30 W. Spring St 4<sup>th</sup> Floor](#)  
[Columbus, Ohio 43215](#)

**Non-responsive Bid for Failure to Submit Bid Guaranty**  
Each Bidder MUST SUBMIT BOTH THE ELECTRONIC FACSIMILE AND THE ORIGINAL UNALTERED BID GUARANTY as described above. The Contracting Authority SHALL REJECT A BID AS NON-RESPONSIVE if the Bidder fails to submit BOTH elements of the Bid Guaranty. The checkboxes below are to identify that you have uploaded the other form of Bid Guaranty. DO NOT CHECK ALL BOXES. Refer to Section 2.10.1 of the Instructions to Bidders.

**Submission of Bidder's Qualifications and EDGE Affidavit**  
The Bidder is encouraged to submit background information with its Bid using Document 00 45 13 - "Bidder's Qualifications" and Document 00 45 39 - "EDGE Affidavit" with the EDGE-certified Business(es) the Bidder proposes to use on the Project (forms provided for the Bidder's convenience in the block above). If the Bidder does not submit the Bidder's Qualifications form and/or the EDGE Affidavit form and related information attached to the electronic Bid Form, the Bidder shall provide it within 3 days of request. Refer to Sections 2.10.3 and 3.5.4 of the Instructions to Bidders.

**■ Required Bid Guaranty Upload**

Name	File*

<p>Document 00 43 13 - Bid Security Form</p> <p>→ Upload a scan of the fully executed Bid Security Form AND submit the original document to the Contracting Authority within 3 days of the bid deadline</p>	<p><a href="#">Select file...</a> no file selected</p> <p><input type="checkbox"/> I am NOT enclosing this document because the <a href="#">omission terms</a> have been met. (Bidder submitted a Cashier's check below)</p>
<p>Power of Attorney</p> <p>→ Upload a scan of the fully executed Power of Attorney AND submit the original document to the Contracting Authority within 3 days of the bid deadline</p>	<p><a href="#">Select file...</a> no file selected</p> <p><input type="checkbox"/> I am NOT enclosing this document because the <a href="#">omission terms</a> have been met. (Bidder submitted a Cashier's check below OR included with the Bid Security Form above)</p>
<p>Cashier's Check for 10% of the Bid</p> <p>→ Upload a scan of the Cashier's Check AND submit the original check to the Contracting Authority within 3 days of the bid deadline</p>	<p><a href="#">Select file...</a> no file selected</p> <p><input type="checkbox"/> I am NOT enclosing this document because the <a href="#">omission terms</a> have been met. (Bidder submitted the Bid Security Form AND Power of Attorney above)</p>
<p>3 Required Documents</p>	

**■ Bidder's Qualifications and EDGE Affidavit Upload**

Name	File*
<p>Document 00 45 13 - Bidder's Qualifications</p> <p>→ Upload fully completed form and attachments</p>	<p><a href="#">Select file...</a> no file selected</p> <p><input type="checkbox"/> I am NOT enclosing this document because the <a href="#">omission terms</a> have been met. (Must be submitted to the Contracting Authority within 3 days of request)</p>
<p>Document 00 45 39 - EDGE Affidavit</p> <p>→ Upload a completed form for each EDGE business</p>	<p><a href="#">Select file...</a> no file selected</p> <p><input type="checkbox"/> I am NOT enclosing this document because the <a href="#">omission terms</a> have been met. (Must be submitted to the Contracting Authority within 3 days of request)</p>
<p>2 Required Documents</p>	

**■ Bidder Signatory Information**

**Name of Bidder's Authorized Signatory\***

**Title\***  **Company Name\***

**Mailing Address\***

**Telephone Number\***  **Facsimile Number**  **E-Mail Address\***

**Where Incorporated\***  **Federal Tax Identification Number\***

**Date enrolled in an OBWC-approved DFSP (month/date/year)**

**Contact person for Contract processing\***

<input type="text"/>
<b>President or Chief Executive Officer's Name / Title*</b>
<input type="text"/>

**Joint Venture Bidder Signatory Information**

**Optional Component: I am NOT bidding on Joint Venture Bidder Signatory Information**

<b>Name of Bidder's Authorized Signatory*</b>		
<input type="text"/>		
<b>Title*</b>	<b>Company Name*</b>	
<input type="text"/>	<input type="text"/>	
<b>Mailing Address*</b>		
<input type="text"/>		
<b>Telephone Number*</b>	<b>Facsimile Number</b>	<b>E-Mail Address*</b>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Where Incorporated*</b>	<b>Federal Tax Identification Number*</b>	
<input type="text"/>	<input type="text"/>	
<b>Date enrolled in an OBWC-approved DFSP (month/date/year)</b>		
<input type="text"/>		
<b>Contact person for Contract processing*</b>		
<input type="text"/>		
<b>President or Chief Executive Officer's Name / Title*</b>		
<input type="text"/>		

**END OF DOCUMENT**



**Document 00 43 13 - Bid Security Form**  
**State of Ohio Standard Requirements for Public Facility Construction**

---

( Form of combined Bid Guaranty and Bond prescribed by Ohio Revised Code Section 153.571 )

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned \_\_\_\_\_,  
\_\_\_\_\_, as Principal,  
and \_\_\_\_\_ as Sureties,  
are hereby held and firmly bound unto \_\_\_\_\_  
\_\_\_\_\_ as Obligee(s), in the penal sum of the dollar amount of the Bid submitted by the Principal  
to the Obligee on \_\_\_\_\_ (date) to undertake the Project known as:

Project Number: \_\_\_\_\_

Project Name: \_\_\_\_\_

Contract Description: \_\_\_\_\_  
(e.g., General Contractor/Trades, Plumbing, HVAC, Electrical)

The penal sum, referred to herein, shall be the dollar amount of the Principal's Bid to the Obligee, incorporating any additive alternate Bids made by the Principal on the date referred to above to the Obligee, which are accepted by the Obligee. In no case shall the penal sum exceed the amount of dollars (\$ \_\_\_\_\_). (If the preceding line is left blank, the penal sum will be the full amount of the Principal's Bid, including add alternates. Alternatively, if completed, the amount stated shall not be less than the full amount of the Bid, including Alternates, in dollars and cents. A percentage is not acceptable.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above-named Principal has submitted a Bid for the above referenced Project;

NOW, THEREFORE, if the Obligee accepts the Bid of the Principal, and the Principal fails to enter into a proper contract in accordance with the Bid, Plans, Specifications, details, and bills of material; and in the event the Principal pays to the Obligee the difference, not to exceed ten percent of the penal sum hereof between the amount specified in the Bid and such larger amount for which the Obligee may in good faith contract with the Bidder determined by the Obligee to be the next lowest responsive and responsible to perform the Work covered by the Bid; or in the event the Obligee does not award the Contract to such next lowest responsive and responsible Bidder and resubmits the Project for bidding, the Principal pays to the Obligee the difference not to exceed ten percent of the penal sum hereof between the amount specified in the Bid, or the costs, in connection with the resubmission, of printing new Contract Documents, required advertising and printing and mailing notices to prospective Bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect. If the Obligee accepts the Bid of the Principal, and the Principal, within 10 days after the awarding of the Contract, enters into a proper contract and executes the Agreement Form in accordance with the Contract Documents, including without limitation the Bid, Plans, Specifications, details, and bills of material, which said Contract is made a part of this Bond the same as though set forth herein; and

NOW ALSO, IF THE SAID Principal shall well and faithfully perform each and every condition of such Contract; and indemnify the Obligee against all damage suffered by failure to perform such Contract according to the provisions thereof and in accordance with the Contract Documents, including without limitation Plans, Specifications, details, and bills of material therefore; and shall pay all lawful claims of Subcontractors, Material Suppliers and laborers for labor performed and materials furnished in the carrying forward, performing or completing of said Contract; we, agreeing and assenting that this undertaking shall be for the benefit of any Subcontractor, Material Suppliers or laborer having a just claim, as well as for the Obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.



THE SAID Surety hereby stipulates and agrees that no modifications, omissions or additions, in or to the terms of said Contract, the Work thereunder or the Contract Documents, including without limitation the Plans and Specifications, therefore, shall in any way affect the obligations of said Surety on its bond, and it does hereby waive notice of any such modifications, omissions or additions in or to the terms of the Contract, the Work, or the Contract Documents, including without limitation the Plans and Specifications.

SIGNED AND SEALED this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

**PRINCIPAL:**

**SURETY:**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

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

By: \_\_\_\_\_  
Attorney-in-Fact

\_\_\_\_\_  
Title

**SURETY INFORMATION:**

**SURETY AGENT'S INFORMATION:**

\_\_\_\_\_  
Name

\_\_\_\_\_  
Name

\_\_\_\_\_  
Address 1

\_\_\_\_\_  
Address 1

\_\_\_\_\_  
Address 2

\_\_\_\_\_  
Address 2

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
Telephone

\_\_\_\_\_  
Telephone

\_\_\_\_\_  
Email

\_\_\_\_\_  
Email

**END OF DOCUMENT**

# Document 00 45 13 - Bidder's Qualifications

## State of Ohio Standard Requirements for Public Facility Construction

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Project Number: \_\_\_\_\_

Project Name: \_\_\_\_\_

1. Company Name: \_\_\_\_\_

Physical Address: \_\_\_\_\_  
Street, Building, Unit

\_\_\_\_\_  
City, State, Zip

Mailing Address (if different): \_\_\_\_\_  
P.O. Box

\_\_\_\_\_  
City, State, Zip

Telephone Number (w/ Area Code): ( \_\_\_\_\_ ) \_\_\_\_\_

Fax Number (w/ Area Code): ( \_\_\_\_\_ ) \_\_\_\_\_

Email address: \_\_\_\_\_

2. **Overall Experience.** Indicate Bidder's overall experience performing the trades bid, including the years in business performing the trade under present and former business names.

3. **Financial.** The apparent low Bidder shall submit, upon request of the Contracting Authority, either:

- a) An annual financial statement prepared within the 12 months prior to the bid opening by an independent licensed accounting firm; and the name, address, contact person and phone number of the bank normally used by the Bidder for its primary banking; or,
- b) A financial report generated within 30 days prior to the bid opening from Standard and Poor, Dun and Bradstreet or a similar company acceptable to the Contracting Authority documenting the financial condition of the Bidder; and the name, address, contact person and phone number of the bank normally used by the Bidder for its primary banking;

**This information is not a public record under Ohio Revised Code Section 149.43; and shall remain confidential, except under proper order of a court.**



e) EPA/OSHA violations

f) Liquidated damages and Statutory Delay Forfeiture assessed

g) Drug-Free Safety Program and Drug Free Workplace Program violations

7. **Management.** Identify individuals assigned to this Project.

Principal \_\_\_\_\_ Years with firm \_\_\_\_\_ Total Exp. \_\_\_\_\_

Project Manager \_\_\_\_\_ Years with firm \_\_\_\_\_ Total Exp. \_\_\_\_\_

Field Superintendent \_\_\_\_\_ Years with firm \_\_\_\_\_ Total Exp. \_\_\_\_\_

8. **EDGE Participation.** Identify EDGE-certified Business Enterprises proposed as Subcontractors and Material Suppliers for this Project. Attach a fully completed Document 00 45 39 - "EDGE Affidavit" for each EDGE-certified Business Enterprise.

9. **Certification.** I hereby certify that the information in this entire Bidder's Qualifications form, including all attachments and referenced information, is factual and complete.

Company Name \_\_\_\_\_

Authorized Official (please print or type) \_\_\_\_\_

Signature of Authorized Official \_\_\_\_\_ Date \_\_\_\_\_

**END OF DOCUMENT**



**Document 00 45 39 - EDGE Affidavit**  
**State of Ohio Standard Requirements for Public Facility Construction**

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**EDGE PARTICIPATION**

**Certified Statement of Intent to Contract and Perform**

**Bidder or Proposer:** Submit one fully completed form for each EDGE-certified Business

**Project:** \_\_\_\_\_

**Project Name:** \_\_\_\_\_

**A. Bidder or Proposer's Company Name:** \_\_\_\_\_

Mark all that apply:

Multi-Prime Contract     General Contract     CM at Risk Contract     Design-Build Contract

**B. EDGE-certified Business information** (for contract at ANY tier)

Mark all that apply:

Subcontractor     Material Supplier     Professional Services     Goods & Services

EDGE Business Name: \_\_\_\_\_

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

EDGE Certification Number: \_\_\_\_\_ E-mail: \_\_\_\_\_

Contact Person: \_\_\_\_\_ Phone: \_\_\_\_\_

Insert detailed description of materials, labor, services, supplies, etc. (may use industry codes – continue on separate page):

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

**C. Certification of Intent**

By signing below, the Bidder or Proposer certifies that it intends to contract with the EDGE-certified Business for the portion of the contract described above related to its Contract for this Project and for the estimated cost shown below. By signing below, the EDGE-certified Business certifies that it intends to contract with the Bidder or Proposer and intends to provide the portion of the contract described above related to the Contract for this Project for the estimated cost of:

\_\_\_\_\_ and \_\_\_\_\_ /100 dollars ( \$ \_\_\_\_\_ ).

In the event the named Bidder or Proposer is NOT awarded a Contract, this Statement shall be null and void.

***EDGE-certified Business***

***Bidder or Proposer***

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Date Signed

\_\_\_\_\_  
Date Signed

**END OF DOCUMENT**



# Document 00 52 00 - Agreement Form

## State of Ohio Standard Requirements for Public Facility Construction

This Agreement is made as of the date set forth below between the State of Ohio, acting by and through the Contracting Authority, and the Contractor in connection with the Project.

**Project Number:** DOT-200023  
**Project Name:** ODOT Eaton Outpost  
**Site Address:** 5656 US-127  
 Eaton, Ohio 45320

**Owner:** Ohio Department of Transportation  
**Owner's Representative:** Carrie Yost  
**Address:** 1600 W. Broad St, Suite 2033  
 Columbus, Ohio 43223

**Contracting Authority:** Ohio Facilities Construction Commission  
**Project Manager:** Wade Simpson  
**Address:** 30 W. Spring St., 4<sup>th</sup> floor  
 Columbus, Ohio 43215

**Contractor:** <insert name>  
**Contractor's Principal Contact:** <insert name>  
**Address:** <insert street address>  
 <insert city, state zip code>

**Architect/Engineer ("A/E"):** Jerome M. Scott Architects, Inc.  
**A/E's Principal Contact:** Dano Boyne  
**Address:** 1020 Goodale Blvd.  
 Columbus, Ohio 43202

### ARTICLE 1 - SCOPE OF WORK; EDGE COMMITMENT

- 1.1 The Contractor shall perform and provide all of the Work described in the Contract.
- 1.2 The project delivery method for this Project shall be General Contracting.
- 1.3 The Contractor shall contract with EDGE-certified Business(es) for not less than 5 percent of the Contract Sum.

### ARTICLE 2 - COMPENSATION

2.1 The Owner shall pay the Contractor the Contract Sum for the Contractor's proper, timely, and complete performance of the Contract. The Contract Sum is \$<insert amount>, subject to Modifications as provided in the Contract Documents. The Contract Sum is comprised of the following:

- 2.1.1 Base Bid: .....\$<Insert Base Bid Amount>
- 2.1.2 Alternate <Insert Alternates Awarded>: .....\$<Insert Alternate Amount>
- 2.1.3 Alternate <Insert Alternates Awarded>: .....\$<Insert Alternate Amount>
- 2.1.4 Alternate <Insert Alternates Awarded>: .....\$<Insert Alternate Amount>
- 2.1.5 Alternate <Insert Alternates Awarded>: .....\$<Insert Alternate Amount>

### ARTICLE 3 - CONTRACT TIMES

3.1 The Contract Times are the periods established in the following table for the achievement of the associated Milestones:

Construction Stage Milestone(s) to which Liquidated Damages apply	Contract Time	Projected Date (as of the date of this Agreement)
Substantial completion of all work ( <i>Milestone M2</i> )	225 days	October 31, 2022



Construction Stage Milestone(s) to which Liquidated Damages apply	Contract Time	Projected Date (as of the date of this Agreement)
Completion of all punch list items ( <i>Milestone M3</i> )	255 days	November 30, 2022

3.1.1 The projected dates listed under “Projected Date (as of the date of this Agreement)” are provided only for convenient reference during consideration of the Agreement. The durations listed under “Contract Time” define the Contract Times and take precedence over the projected dates.

**ARTICLE 4 - KEY PERSONNEL**

4.1 The Contractor’s key personnel for the Project are:

- 4.1.1 «insert name», Project Manager;
- 4.1.2 «insert name», Lead Scheduling Engineer;
- 4.1.3 «insert name», General Superintendent.

4.2 The Contractor’s key personnel are authorized to act on the Contractor’s behalf with respect to the Project and all matters concerning the Project.

**ARTICLE 5 - GENERAL PROVISIONS**

5.1 Effectiveness.

5.1.1 It is expressly understood by the Contractor that none of the rights, duties, and obligations described in the Contract Documents shall be valid and enforceable unless the Director of the Office of Budget and Management first certifies that there is a balance in the Owner’s appropriation not already encumbered to pay existing obligations and until all relevant statutory provisions of the Ohio Revised Code, including ORC Section 126.07, have been complied with, and until such time as all necessary funds are available or encumbered and, when required, such expenditure of such funds is approved by the State Controlling Board, or other applicable approving body.

5.1.2 In addition, if federal funds are to be used to pay fees and expenses under this Agreement, none of the rights, duties, and obligations contained in this Agreement shall be binding on any party until the Owner gives the Contractor written notice that such funds are available from the Owner’s funding source.

5.1.3 Subject to **Section 5.1.1**, the Contract shall become binding and effective upon execution by the Contracting Authority, Owner, Contractor, and Ohio Attorney General.

5.1.3.1 If the Contractor is a joint venture, (1) each individual joint venturer shall (a) sign the Agreement in its own name and (b) be a party to the Contract, and (2) the Contract and the Performance and Payment Bond shall be binding on and apply to all joint venturers jointly and severally.

5.1.3.2 If the Contractor is a limited liability company, which the Contracting Authority reasonably believes to be a special purpose or similar entity, the Contracting Authority may in its discretion require the limited liability company and each member of the limited liability company to (1) sign the Agreement in its own name and (2) be a party to the Contract. In that case, the Contract and the Performance and Payment Bond shall be binding on and apply to the limited liability company and to all of its members jointly and severally.

5.1.4 This Agreement may be executed in several counterparts, each of which shall constitute a complete original Agreement, which may be introduced in evidence or used for any other purpose without production of any other counterparts.

5.2 Representations.

5.2.1 The Contractor represents and warrants that it is not subject to an unresolved finding for recovery under ORC Section 9.24. If this representation and warranty is found to be false, the Contract is void, and the Contractor shall immediately repay to the Owner any funds paid under this Contract.

5.2.2 The Contractor hereby certifies that neither the Contractor nor any of the Contractor’s partners, officers, directors, shareholders nor the spouses of any such person have made contributions in excess of the limitations specified in ORC Section 3517.13.

5.2.3 The Contractor, by signature on this Agreement, certifies that it is currently in compliance with, and will continue to adhere to, the requirements of Ohio ethics laws and conflict of interest laws and will take no action inconsistent with those laws.

5.2.4 The Contractor affirms to have read and understands Executive Order 2019-12D and shall abide by those requirements in the performance of this Contract. Notwithstanding any other terms of this Contract, the State reserves the right to recover any funds paid for services the Contractor performs outside of the United States for which it did not receive a waiver. The State does not waive any other rights and remedies provided the State in this Contract.

5.2.5 Pursuant to ORC Section 9.76(B), the Contractor warrants that it is not boycotting any jurisdiction with whom the State of Ohio can enjoy open trade, including Israel, and will not do so during the term of this Contract.

**ARTICLE 6 - Enumeration of Documents**

6.1 The Contract Documents constitute the substance of the Contract, and include this Agreement, Drawings, Specifications, Addenda if any, **Contracting Definitions, General Conditions**, Supplementary Conditions if any, **Bid Form, Wage Rate Requirements, Bid Guaranty and Contract Bond or Performance and Payment Bond**, and Change Orders if any.

**SIGNATURES**

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date set forth below:

«INSERT CONTRACTOR’S NAME»

STATE OF OHIO

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Printed Name*

\_\_\_\_\_  
*Printed Name*

\_\_\_\_\_  
*Title*

\_\_\_\_\_  
*Title*

**OWNER’S CONCURRENCE**  
by «insert Owner’s name»

**OHIO ATTORNEY GENERAL**  
Approval as to Form

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Printed Name*

\_\_\_\_\_  
*Printed Name*

\_\_\_\_\_  
*Title*

\_\_\_\_\_  
*Title*

\_\_\_\_\_  
*Purchase Order No.*

\_\_\_\_\_  
*Date*

**END OF DOCUMENT**



# Document 00 52 14 - State of Ohio Subcontract Form

## State of Ohio Standard Requirements for Public Facility Construction

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This Agreement is made as of the date set forth below between the Contractor and the Subcontractor in connection with the Project.

**Project Number:** DOT-200023  
**Project Name:** Eaton Outpost  
Site Address: 5656 US-127  
Eaton, Ohio 45320

**Contractor:** «insert name»  
Contractor's Principal Contact: «insert name»  
Address: «insert street address»  
«insert city, state zip code»

**Subcontractor:** «insert name»  
Subcontractor's Principal Contact: «insert name»  
Address: «insert street address»  
«insert city, state zip code»

**Public Authority:** «insert name»  
Public Authority Contact: «insert name»  
Address: «insert street address»  
«insert city, state zip code»

### ARTICLE 1 - NATURE OF SUBCONTRACT

1.1 The Subcontractor shall perform the entire Subcontract Work as specified in Exhibit «N» and described in the Contract Documents for the Project.

### ARTICLE 2 - COMPENSATION

2.1 The Contractor agrees to pay for the performance of this Subcontract, subject to additions and deductions as provided in the Contract Documents, the Subcontract Sum of «insert Subcontract Sum», comprised of the following:

«insert Subcontract Sum component» ..... \$«insert amount»  
«insert Subcontract Sum component» ..... \$«insert amount»  
«insert Subcontract Sum component» ..... \$«insert amount»  
«insert Subcontract Sum component» ..... \$«insert amount»

### ARTICLE 3 - TIME OF PERFORMANCE

3.1 Time is of the essence. The Subcontractor shall diligently prosecute and complete all Subcontract Work in accordance with the construction progress schedule agreed between the parties.

### ARTICLE 4 - CONTRACT DOCUMENTS

4.1 To the extent that the contract between the Public Authority and the Contractor applies to the Subcontract Work:

4.1.1 The Contractor and the Subcontractor agree to be mutually bound by the terms of the Contract Documents;

4.1.2 The Contractor assumes toward the Subcontractor the rights, remedies, obligations, and responsibilities that the Public Authority has and assumes toward the Contractor;

**4.1.3** The Subcontractor assumes toward the Contractor the rights, remedies, obligations, and responsibilities that the Contractor assumes toward the Public Authority; and

**4.1.4** The Subcontractor agrees to perform its portion of the Work in accordance with the Contract Documents.

**4.2** The Subcontract and any modifications, amendments, or alterations thereto shall be governed, construed, and enforced by and under the laws of the State of Ohio.

**4.3** If any term or provision of the Subcontract, or the application thereof to any Person or circumstance, is finally determined, to be invalid or unenforceable by a court of competent jurisdiction, the remainder of the Subcontract or the application of such term or provision to other Persons or circumstances, shall not be affected thereby, and each term and provision of the Subcontract shall be valid and enforced to the fullest extent permitted by law.

**4.4** The Subcontract shall be binding on the Contractor and Subcontractor, their successors and assigns, in respect to all respective covenants and obligations contained in the Contract Documents, but the Subcontractor may not assign the Subcontract without the prior written consent of the Contractor and the Public Authority.

## ARTICLE 5 - EFFECTIVENESS

**5.1** The Subcontract shall become binding and effective upon execution by the Contractor.

**5.2** This Subcontract has been executed in several counterparts, each of which shall constitute a complete original Subcontract, which may be introduced in evidence or used for any other purpose without production of any other counterparts.

**5.3** Any signatory may deliver a copy of its counterpart signature page to this Subcontract via fax or e-mail. Each signatory shall be entitled to rely upon a signature of any other signatory delivered in such a manner as if such signature were an original.

## ARTICLE 6 - REPRESENTATIONS

**6.1 Contingent Assignment.** The Contractor's contingent assignment of this Subcontract to the Public Authority, as provided in the Contract, is effective after termination of the Contractor by the Public Authority and the Public Authority's acceptance of the assignment in writing to the Subcontractor. The Subcontractor consents to the assignment and shall be bound at the same price and terms as in the Subcontract to the Public Authority. Unless the Public Authority takes assignment of the Subcontract, the Subcontractor will not have any contractual rights against the Public Authority.

**6.2 Intended Third-Party Beneficiary.** The Public Authority is an intended third party beneficiary of the Subcontract, entitled to enforce any rights thereunder for its benefit.

**6.3 Insurance.** The Subcontractor shall maintain insurance in accordance with the Contract Documents. Exhibit «N» sets forth the minimum limits of liability for the insurance required in the Contract Documents.

**6.4 Right to Audit.** The Subcontractor agrees that the Public Authority or any agents designated by the Public Authority have access to and the right to audit and the right to copy at the Public Authority's cost all of the Subcontractor's books, records, contracts, correspondence, instructions, drawings, receipts, vouchers, purchase orders, and memoranda relating to the Work for a period of not less than 3 years following completion of the Work consistent with Ohio Revised Code ("ORC") Section 149.43 with regard to the Public Authority's obligation to maintain confidentiality of trade secrets.

**6.5 Indemnity.** To the fullest extent permitted by law, the Subcontractor shall indemnify, defend, and hold harmless the Public Authority, the Contractor, their consultants and employees from all claims and expenses for bodily injury and property damage other than to the Work itself that may arise from the performance of the Subcontract Work, including reasonable attorneys' fees, costs and expenses, but only to the extent caused by the negligent acts or omissions of the Subcontractor or a person or entity for whom the Subcontractor may be liable. This Subcontract does not require a Subcontractor to waive its immunity under the Workers Compensation laws of Ohio from claims brought against the Subcontractor by the Subcontractor's employees.

**6.6 Prompt Pay.** The Contractor shall at a minimum make payments to the Subcontractor in accordance with Applicable Law, including ORC Section 4113.61. Progress payments to the Subcontractor for satisfactory performance of Subcontract Work shall be made no later than 10 days after receipt by the Contractor of payment from the Public Authority for Subcontract Work.

**6.7 Retainage.** Subcontractor retainage shall be at a rate equal to the percentage retained from the Contractor's payment by the Public Authority for the Subcontract Work, unless a lesser percentage is otherwise specified.

**6.7.1 Labor Payments.**

**6.7.1.1** Partial payments to the Subcontractor for labor performed shall be made at the rate of 92 percent of the amount invoiced through the Subcontractor's request for payment that shows the Work of the Subcontractor is 50 percent complete.

**6.7.1.2** After the Work of the Subcontractor is 50 percent complete, as evidenced by payments of at least 50 percent of the total amount due under the Subcontract, no additional funds shall be retained from payments for labor.

**6.7.2 Material Payments.**

**6.7.2.1** The Contractor shall pay the Subcontractor at the rate of 100 percent of the scheduled value for materials incorporated into the Project.

**6.7.2.2** The Contractor shall pay the Subcontractor at the rate of 92 percent of the invoice cost, not to exceed the scheduled value, for materials delivered to the Site, or other off-site storage location approved by the A/E, provided the Subcontractor provides the following information with its request for payment:

- .1 a list of the fabricated materials consigned to the Project, giving the place of storage, together with copies of invoices, in order to verify quantity and cost; and
- .2 a certification of materials stored off-site, prepared by the Subcontractor and signed by the A/E to evidence that the materials are in conformity with the Specifications and have been tagged with the Project name and number for delivery to the Project. The Subcontractor shall reimburse the A/E, through the Contractor, for all costs incurred to visit a storage site, other than the areas adjacent to the Project.
- .3 The Contractor shall pay the balance of the scheduled value when the materials are incorporated into and become a part of the Project.

**6.8 Warranty.** The Subcontractor fully warrants, for the benefit of the Public Authority, that all materials and equipment shall be new unless otherwise specified, of good quality, in conformance with the Contract Documents and free from defective workmanship or materials.

**6.9 Non-Waiver of Lien Rights or Payment Bond Rights.** This Subcontract shall not prohibit a Subcontractor from exercising its rights under ORC Chapter 1311 or under any Contractor-provided payment bond.

**6.10 Non-Discrimination.** The Subcontractor agrees to fully comply with Applicable Law regarding equal opportunity, including ORC Section 153.59 and, to the extent applicable, all Executive Orders issued by the Governor of the state of Ohio.

**6.11 Dispute Resolution.** The supplemental conditions to this Subcontract shall provide for a dispute resolution process comparable to the Contract's dispute resolution process in terms of timing, notice, substantiation, and informal dispute resolution efforts. The dispute resolution process provided in the supplemental conditions shall result in prompt access to the ultimate dispute resolution mechanism selected by the parties.

**6.12** In the event that any supplemental conditions or other Subcontract terms conflict with the **State of Ohio Subcontract Form**, the **State of Ohio Subcontract Form** takes precedence and this Subcontract shall be read and enforced to include the provisions of the **State of Ohio Subcontract Form**.

**6.13** The following exhibits are attached to and are a part of this Subcontract:

**6.13.1 Exhibit A:**

**6.13.2 Exhibit B:**

**6.13.3 Exhibit C:**

**6.13.4 Exhibit D:**

**SIGNATURES**

IN WITNESS WHEREOF, the parties have executed this Subcontract Form.

«INSERT SUBCONTRACTOR'S NAME»

«INSERT CONTRACTOR'S NAME»

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Printed Name*

\_\_\_\_\_  
*Printed Name*

\_\_\_\_\_  
*Title*

\_\_\_\_\_  
*Title*

\_\_\_\_\_  
*Date*

**END OF DOCUMENT**

# Document 00 61 13 - Performance and Payment Bond Form

## State of Ohio Standard Requirements for Public Facility Construction

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( Form of Bond prescribed by Ohio Revised Code Section 153.57 - Not to be used as Bid Guaranty )

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned \_\_\_\_\_  
\_\_\_\_\_, as Principal,  
and \_\_\_\_\_ as Sureties,  
are hereby held and firmly bound unto \_\_\_\_\_  
\_\_\_\_\_ as Obligee(s), in the penal sum of \_\_\_\_\_ dollars,  
for the payment of which well and truly to be made, we jointly and severally bind ourselves, our heirs, executors,  
administrators, successors, and assigns.

SIGNED AND SEALED this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above-named Principal did on the  
\_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, enter into a Contract with the Obligee, which said Contract is  
made a part of this Bond the same as though set forth herein and which is more fully described as:

Project Number: \_\_\_\_\_

Project Name: \_\_\_\_\_

Contract Description: \_\_\_\_\_  
(e.g., General Trades, Plumbing, HVAC, Electrical)

NOW, THEREFORE, if the above-named Principal shall well and faithfully do and perform the things agreed by the  
Obligee to be done and performed according to the terms of said Contract; and shall pay all lawful claims of Subcontractors,  
Material Suppliers, and laborers, for labor performed and materials furnished in the carrying forward, performing, or  
completing of said Contract; we agreeing and assenting that this undertaking shall be for the benefit of any Subcontractor,  
Material Supplier or laborer having a just claim as well as for the Obligee herein; then this obligation shall be void; otherwise  
the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Sureties for  
any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

THE SAID Surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of  
the said Contract or in or to the Plans and Specifications therefor shall in any wise affect the obligations of said Surety on its  
bond, and it does hereby waive notice of any such modifications, omissions or additions in or to the terms of the Contract, the  
Work or the Contract Documents, including without limitation the Plans and Specifications.



**PRINCIPAL:**

\_\_\_\_\_  
Principal Signature

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

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

**SURETY:**

\_\_\_\_\_  
Surety Signature

By: \_\_\_\_\_  
Attorney-in-Fact

**SURETY INFORMATION:**

\_\_\_\_\_  
Street

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
Telephone Number

**SURETY AGENT'S INFORMATION:**

\_\_\_\_\_  
Agency Name

\_\_\_\_\_  
Street

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
Telephone Number

\_\_\_\_\_  
Email Address

**END OF DOCUMENT**

# Document 00 71 00 - Contracting Definitions (General Contracting Project)

## State of Ohio Standard Requirements for Public Facility Construction

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<b>Acceptable Component</b>	A component listed in the Specifications after the Basis of Design Component.
<b>Addenda or Addendum</b>	Written or graphic instrument issued prior to the bid opening which modifies or interprets the proposed Contract Documents by additions, deletions, clarifications, or corrections. Addenda become part of the Contract Documents when the Agreement is executed.
<b>A/E</b>	See “Architect/Engineer.”
<b>Agreement</b>	The form furnished by the Contracting Authority (including all of its exhibits) that, when completed and signed by the Contractor and Contracting Authority evidences entry into the Contract.
<b>Allowance</b>	A sum stipulated in the Contract Documents for a defined scope of the Work that may not be completely defined at the time of bidding. Allowance amounts do not include the Contractor’s Fee on account of the associated Work.
<b>Alternate</b>	A change in the proposed Project scope, which may include but is not limited to alternate materials or methods of construction, and an amount stated on the Bid form to be added to or deducted from the Base Bid if the corresponding Alternate is incorporated into the Contract.
<b>Alternative Dispute Resolution</b>	A voluntary and non-binding process for the administrative review, consideration, and attempted settlement of a dispute, without resort to judicial process, including but not limited to partnering, negotiation, mediation, impartial fact-finding, dispute review board, and mini-trials, but shall not include arbitration.
<b>Applicable Law</b>	All federal, state, and local codes, statutes, ordinances, and regulations that apply to the performance of the Work or the A/E’s Services on the Project.
<b>Architect/Engineer</b>	The Person responsible for providing professional design services and construction contract administration for the Project as provided in the Contract Documents. The A/E shall be a <b>(1)</b> registered architect holding a license and certificate of authorization issued by the Ohio Architects Board pursuant to ORC Chapter 4703, <b>(2)</b> landscape architect holding a license and certificate of authorization issued by the Ohio Landscape Architects Board pursuant to ORC Chapter 4703, or <b>(3)</b> professional engineer or professional surveyor holding a license and certificate of authorization issued by the Ohio Engineers and Surveyors Board pursuant to ORC Chapter 4733.
<b>As-Built Documents</b>	Documents, including but not limited to Drawings, Addenda, Specifications, executed Change Orders, and other elements of the Contract Documents which the Contractor annotates and otherwise modifies to indicate changes made during the construction process, the location of concealed and buried items, and other information useful to the Owner throughout the life of the completed Project.
<b>Base Bid</b>	The amount stated in a Bid as the sum for which the Bidder offers to perform the Work in a particular trade or other category, which is described in the Contract Documents, excluding Alternates.
<b>Basis of Design</b>	A document that records the concepts, calculations, decisions, and product selections used to meet the Owner’s Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
<b>Basis of Design Component</b>	A component listed first in the Specifications.
<b>Bid</b>	A written proposal to perform a Contract, submitted on a completed Bid Form, accompanied by other required documents. The term Bid includes a proposal that has been digitally signed, encrypted, and submitted through the State’s electronic bidding application pursuant to OAC Section 153:1-8-01.

<b>Bidder</b>	A Person that submitted a Bid.
<b>BIM</b>	See “Building Information Model.”
<b>Bid Form</b>	A form furnished by the Contracting Authority with the proposed Contract Documents that is to be completed, signed, and submitted containing the Bidder's Bid.
<b>Bid Guaranty</b>	A bid bond or other instrument of security authorized by ORC Section 153.54 submitted with the Bid to provide assurance that the Bidder will execute the Agreement.
<b>Bond</b>	A performance and payment bond in the format specified by ORC Section 153.57 submitted by the Contractor to provide assurance that the Contractor will perform the Work of the Contract, including making required payments to Subcontractors and Materials Suppliers.
<b>Building Information Model</b>	A digital representation of physical and functional characteristics of a facility; a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle, which is defined as existing from earliest conception to demolition; electronic files used to design and coordinate the Project; and may be used to describe a single model or multiple models used in the aggregate.
<b>Certificate of Contract Completion</b>	A form used to document that the Contractor’s achievement of Contract Completion. This form may also be used to document partial Contract Completion.
<b>Certificate of Substantial Completion</b>	A form used to document <b>(1)</b> that the Contractor has achieved Substantial Completion of the Work or a designated portion of the Work for which the Contracting Authority and the Owner have agreed to take Partial Occupancy, and <b>(2)</b> the date on which the associated Substantial Completion of the Work was achieved.
<b>Change Directive</b>	A written document prepared by the A/E and executed by the Contracting Authority that directs a change in the Work.
<b>Change Order</b>	A document recommended by the A/E and executed by the Contracting Authority and the Contractor that modifies the Contract.
<b>Claim</b>	A demand or assertion, initiated by written notice, certified by one of the parties to the Contract seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time, or other relief with respect to the terms of the Contract.
<b>Claim Affidavit</b>	A sworn document used in conjunction with filing a lien, which contains a claim on the funds that are due to a Contractor, in favor of a Person supplying labor, materials, or services for the value of labor, materials, or services supplied.
<b>Combined Bid</b>	A Bid that combines bid items for separate Contracts stated on the Bid Form.
<b>Commission</b>	See “Ohio Facilities Construction Commission.”
<b>Commissioning Agent</b>	The Person identified by the Contracting Authority who leads, plans, schedules, and coordinates the commissioning team to implement the Commissioning Process for the Project.
<b>Commissioning Plan</b>	A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the Commissioning Process.
<b>Commissioning Process</b>	A quality-focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that the facility and all of its systems are planned, designed, installed, tested, operated, and maintained to meet the Owner’s Project Requirements.

<b>Commissioning Report</b>	A document that records the activities and results of the Commissioning Process. The Commissioning Report is developed from the final Commissioning Plan with its attached appendices.
<b>Conformed Documents</b>	Contract Documents with all Addenda items and accepted Alternates incorporated by the A/E, published, and issued to a successful Bidder for its use during performance of the Contract. The Conformed Documents are furnished solely for the Contractor's convenience. In the event of any conflict between the Contract Documents modified by Addenda and the Conformed Documents, the Contract Documents take precedence.
<b>Construction Budget</b>	The amount identified in the Agreement as adjusted by the Owner and Contracting Authority.
<b>Construction Cost</b>	The sum of the Contract Cost amounts for a phase of the Project.
<b>Construction Progress Schedule</b>	The critical path schedule for performance of the Contract; showing the time for completing the Work within the Contract Times; the planned sequence for performing the various components of the Work; the interrelationship between the activities of the Contractor, A/E, Contracting Authority, and Owner; and the Contractor's resource and cost loading information; as periodically updated during the performance of the Work.
<b>Contract</b>	The state of legal obligation entered into by the State and the Contractor, whereby they have agreed to an exchange of certain acts, materials, equipment, and services for certain monetary consideration, under all terms and conditions specified in the Contract Documents, which shall remain in full force and effect until such time as all obligations under the Contract have been lawfully and completely discharged, or the Contract is terminated under other conditions specified in the Contract Documents.
<b>Contract Completion</b>	The schedule Milestone in the progress of any Phase when the Work is completed in accordance with the terms of the Contract Documents and Contractor has satisfied all of its other obligations under the Contract Documents, including but not limited to <b>(1)</b> all governmental authorities have given final, written approval of the Work, <b>(2)</b> a final unconditional certificate of occupancy has been granted and issued to the Owner by the appropriate governmental authorities, <b>(3)</b> the Contractor's Work is 100 percent complete, and <b>(4)</b> all Punch List items have been completed or corrected, and <b>(5)</b> the Contractor has complied with conditions precedent to final payment and release of retained funds.
<b>Contract Documents</b>	Collectively, the documents that constitute the substance of the Contract including but not limited to Drawings, Specifications, Addenda if any, General Conditions, Supplementary Conditions if any, Bid Form, Wage Rates; and the executed Agreement, Bid Guaranty and Contract Bond, and Change Orders if any.
<b>Contract Sum</b>	The Contract Sum is the Contractor's entire compensation for the Contractor's proper, timely, and complete performance of the Work and is subject to adjustment as provided in the Contract.
<b>Contract Times</b>	The periods stipulated in the Agreement for the achievement of associated Milestones, in consecutive days, beginning on the date established by the Notice to Proceed, including adjustments authorized by executed Change Orders.
<b>Contracting Authority</b>	The party identified in the Agreement, which may be the Ohio Facilities Construction Commission; an agency of the state of Ohio; an Institution of Higher Education or division thereof; a School District Board; or the legislative body of a political subdivision.
<b>Contractor</b>	A firm, which is party to the Contract for the performance of Work on the Project in accordance with the Contract Documents.
<b>Contractor's Documents</b>	All Project-related documents, including those in electronic form, prepared by the Contractor and its Subcontractors.

<b>Contractor's Fee</b>	The portion of the Contract Sum attributable to the aggregate of the Contractor's profit and home-office overhead related to the Contractor's proper, timely, and complete performance of the Work.
<b>Contractor Payment Request</b>	The form furnished by the Commission that is to be used by the Contractor in requesting payments and which, when signed by the Contractor, shall serve as an affidavit that payments requested are in proportion to the Work completed as shown on the Schedule of Values.
<b>Contractor's Punch List</b>	A document prepared by the Contractor that consists of a list of items of Work to be completed or corrected by the Contractor as a condition precedent to Contract Completion.
<b>Coordination Drawings</b>	Drawings and Electronic Files prepared by the Contractor to demonstrate how multiple-system and interdisciplinary work will be coordinated. Clash reports generated by BIM authoring software may be included in the Coordination Drawing submittals if applicable.
<b>Correction Period</b>	A period of one year commencing on the date of Substantial Completion of the Work or a designated portion of the Work which the Contracting Authority and Owner have agreed to take Partial Occupancy.
<b>CxA</b>	See "Commissioning Agent."
<b>Date of Commencement</b>	The date established in a Notice to Proceed issued by the Contracting Authority to the Contractor to mark the start of the Work and the beginning of the running of the Contract Times.
<b>day</b>	A calendar day of 24 hours measured from midnight to midnight, unless otherwise expressly specified to mean a business day.
<b>Defective Work</b>	Work that does not conform to the Contract Documents; or does not meet the requirements of any applicable statute, rule or regulation, inspection, reference standard, test or approval; or has been damaged prior to the A/E's recommendation of final payment, unless responsibility for the protection thereof has been expressly assumed by the Owner; or that is not free from defects in workmanship, materials or equipment during the period of any warranty or guarantee.
<b>Differing Site Condition</b>	Either <b>(1)</b> a subsurface or otherwise concealed physical condition encountered at the Site that differs materially from the conditions indicated in the Contract Documents or <b>(2)</b> an unknown physical condition of an unusual nature encountered at the Site that differs materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents.
<b>Dispute Review Board</b>	A form of Alternative Dispute Resolution that is typically comprised of three members, selected jointly by the Contractor and the Contracting Authority, to monitor the progress of construction and provide recommended resolutions to disputes that are brought before them.
<b>Drawings</b>	Graphic portions of the Contract Documents, showing the design, type of construction, location, dimension, and character of the Work to be provided by the Contractor, which generally includes plans, elevations, sections, details, schedules, diagrams, notes, and text.
<b>Electronic File</b>	Information maintained in a computer system or format that is intended to facilitate a Person's use and manipulation of the information including but not limited to Word, Excel, PDF, Primavera, CAD, and BIM files all in their native format.
<b>Enclosure, Permanent</b>	The condition in which the permanent exterior walls and roofs are in place, insulated and weathertight, and permanent windows and entrances are in place.
<b>Enclosure, Temporary</b>	The condition in which the permanent exterior walls and roofs are in place, insulated and weathertight, and windows and entrances are provided with suitable temporary enclosures.

<b>Estimated Construction Cost</b>	The sum of the Estimated Contract Cost amounts published in the Solicitation, as modified by Addenda, for a phase of the Project.
<b>Estimated Contract Cost</b>	The estimated amount for the Contract published in the Solicitation, including the Base Bid estimate and the estimates of selected Alternates, if any, as modified by Addenda.
<b>Extra Materials</b>	Materials required by the Contract Documents that are not incorporated into the Project but are given to the Owner to be used for future maintenance or repairs.
<b>Final Inspection</b>	The final review of the Work of the Contractor by the A/E to determine whether issuance of the Certificate of Contract Completion is appropriate.
<b>furnish</b>	Supply and deliver to the Site, or other specified location, ready for installation.
<b>General Conditions</b>	The State's Standard General Conditions currently in effect, which may be modified by the Commission from time to time.
<b>General Conditions Costs</b>	General Conditions Costs include only the Contractor's costs to provide the general conditions Work including without limitation the costs of all of the following Site-related items: scheduling and coordinating the Work. telephone, telephone charges, facsimile, telegrams, postage, photos, photocopying, hand tools, simple scaffolds (one level high), tool breakage, tool repairs, tool replacement, tool blades, tool bits, and pre-approved travel, lodging, and parking costs. General Conditions Costs also include <b>(1)</b> Bond premiums and <b>(2)</b> premiums for builder's risk insurance if the Contractor purchases the builder's risk policy for the Project.
<b>Hazardous Materials</b>	Any material, substance, pollutant, or contaminant that is defined, regulated, referenced, or classified in the Comprehensive Environmental Response, Compensation and Liability Act, Federal Water Pollution Control Act, the Resource Conservation and Recovery Act, Clean Air Act, Hazardous Materials Transportation Uniform Safety Act, Toxic Substances Control Act, or any other Applicable Law relating to any hazardous, toxic, or dangerous waste, substance, or material. Any substance or material that, after release into the environment or upon exposure, ingestion, inhalation, or assimilation, either directly from the environment or directly by ingestion through food chains, will, or may reasonably be anticipated to, cause death, disease, behavior abnormalities, cancer or genetic abnormalities and specifically includes but is not limited to asbestos, polychlorinated biphenyls ("PCBs"), radioactive materials, including radon and naturally occurring radio nuclides, natural gas, natural gas liquids, liquefied natural gas, synthetic gas, oil, petroleum and petroleum-based derivatives and urea formaldehyde.
<b>Indemnified Parties</b>	The State, Contracting Authority, Owner, A/E, other Separate Consultants, and their respective officials, officers, consultants, agents, representatives, and employees, in both individual and official capacities.
<b>install</b>	Put into use or place in final position, complete and ready for intended service or use.
<b>Institutional Designee</b>	The party identified in the Agreement empowered with a level of authority similar to the Executive Director of the Commission, which may be the university architect or engineer, director of capital facilities, or an institution vice president.
<b>Institution of Higher Education</b>	Any state of Ohio university or college, community college, state of Ohio community college, technical college, university branch, community college district, technical college district, university branch district, and the applicable board of trustees or, in the case of a university branch district, any other managing authority.
<b>Liquidated Damages</b>	A sum established in the Contract Documents, pursuant to the statutory delay forfeiture authorized under ORC Section 153.19, to be paid to the Owner due to the Contractor's failure to complete the Work within the Contract Time for achievement of Substantial Completion, or any applicable portion of the Work on or prior to any Milestone date stated on the Agreement.
<b>Material Supplier</b>	A Person under a contract with the Contractor to furnish materials or supplies in furtherance of the Work, including all such Persons in any tier. Material Supplier

	does not include any Separate Contractor unless expressly assigned in writing to the Contractor by the Owner and accepted by the Contractor.
<b>mediation</b>	A voluntary process in which a neutral third party meets with the parties who have a disagreement or dispute and attempts to facilitate a mutually satisfactory resolution.
<b>Milestone</b>	A principal event specified in the Contract relating to an intermediate completion date or time prior to and including Substantial Completion of all Work.
<b>Modification</b>	A <b>(1)</b> written amendment to the Contract signed by both parties, <b>(2)</b> Change Order, <b>(3)</b> Change Directive, or <b>(4)</b> an order for a minor change in the Work.
<b>negotiation</b>	A form of Alternative Dispute Resolution in which all parties involved are represented by those invested with the authority to agree to a determination of an adjustment in the Contract Sum, Contract Times, or both.
<b>Neutral Facilitator</b>	An nonpartisan third-party without decision-making authority who is engaged to assist the Project's key stakeholders in developing cooperative relationships, achieving project objectives, avoiding or minimizing disputes, and nurturing a more-collaborative ethic characterized by trust, cooperation and teamwork.
<b>Notice of Commencement</b>	A notice prepared by the Contracting Authority identifying the Project, the Contractors, the Surety for each Contractor, and the name of the Contracting Authority's representative upon whom a Claim Affidavit may be served.
<b>Notice of Intent to Award</b>	A written notice provided by the Contracting Authority to the apparent successful Bidder stating that upon satisfactory compliance with all conditions precedent for execution of a Contract within the time specified, the Contracting Authority intends to execute a Contract with the Bidder.
<b>Notice to Proceed</b>	A written notice provided by the Contracting Authority authorizing the Contractor to proceed with the Work and establishing the dates for commencement and completion of the Work.
<b>OAC</b>	Ohio Administrative Code
<b>Ohio Facilities Construction Commission</b>	The authorized contracting agent for public improvement projects in accordance with ORC Chapters 123 and 153, acting by and through its Executive Director.
<b>ORC</b>	Ohio Revised Code
<b>Owner</b>	The state of Ohio agency, Institution of Higher Education or division thereof, School District Board, or other instrumentality for whom the Project is being constructed.
<b>Owner's Project Requirements</b>	A written document that details the functional requirements of the Project and the expectations of how it will be used and operated. These include project goals, measureable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
<b>Partial Occupancy</b>	The condition that occurs when the Owner occupies or uses a portion of the Project prior to Contract Completion, partial occupancy is approved by authorities having jurisdiction, and items of Work cannot be completed until a subsequent date.
<b>partnering</b>	A voluntary dispute prevention process involving team building activities to help define common goals, improve communication, and foster a problem solving attitude among a group of contracting parties that must work together throughout Contract performance to be less adversarial and more cooperative.
<b>Person</b>	An individual, corporation, business trust, estate, partnership, association, or other public or private entity.
<b>Phase</b>	A separation in the Work of the Project by sequence or time intervals, which may include separate contractors for each Phase.
<b>Plan Holder</b>	A prospective Bidder that received a set of Contract Documents prior to the bid opening.

<b>Product Data</b>	Manufacturer's standard illustrations, schedules, diagrams, performance charts, instructions, and brochures that illustrate physical appearance, size, and other characteristics of materials and equipment.
<b>Project</b>	The public improvement, of which the Work performed under the Contract Documents may be the whole or a part.
<b>Project Manager</b>	A permanent employee of the Contracting Authority assigned to the Project and authorized to perform specific responsibilities.
<b>Project Manual</b>	That part of Construction Documents which consists of bound volume(s) of primarily written material which generally contain Division 00 - "Procurement and Contracting Requirements," and Divisions 01 through 49 - "Specifications," and other documents pertaining to the Project.
<b>Proposal</b>	The offer of a Contractor to perform the Work set forth in a Proposal Request.
<b>Proposal Request</b>	A document issued after execution of the Contract requesting a Proposal from the Contractor(s), which may initiate a Change Order to modify the Contract.
<b>provide</b>	Furnish and install, complete and ready for intended use.
<b>Punch List</b>	A document listing items of Work requiring correction or completion by the Contractor as a condition precedent to Contract Completion.
<b>Record Documents</b>	Electronic files and printed documents of all nature prepared by the A/E, which incorporate the information shown on the Contractor's As-Built Documents. They consist of the "Record Drawings" and "Record Project Manual," Certificate of Substantial Completion, Certificate of Contract Completion (as complete), Contractor's Warranty, Manufacturers' Warrantees, certificate(s) of occupancy, approved shop drawings and other action submittals, Change Directives, Proposal Requests, Requests for Interpretation, Addenda, Change Orders, Balancing Reports, and the final version of the approved Construction Progress Schedule.
<b>Record Drawings</b>	The Drawings, which have been revised by the A/E to show the changes made during the construction process, conformed to represent the Work as executed by the Contractor.
<b>Record Model</b>	The Building Information Model, which has been revised by the A/E to show the changes made during the construction process, conformed to represent the Work as executed by the Contractor.
<b>Record Project Manual</b>	The Project Manual of the Contract Documents, which has been revised by the A/E to show the changes made during the construction process, based on the As-Built Project Manual furnished by the Contractor.
<b>Request for Change Order</b>	A written notice from the Contractor accompanied by a Proposal for a change in the Work.
<b>Request for Interpretation</b>	A written request to the A/E seeking an interpretation or clarification of the Contract Documents.
<b>RFI</b>	See "Request for Interpretation."
<b>Samples</b>	Physical examples, color selection items, field samples, and mock-ups furnished by the Contractor to illustrate functional and aesthetic characteristics of products, materials, equipment, or workmanship and establish criteria by which the Work shall be judged.
<b>Schedule of Values</b>	A full, accurate, and detailed statement furnished by the Contractor reflecting a defined breakdown of the Contract Sum.
<b>School District</b>	A local, exempted village, or city school district as defined in ORC Chapter 3311, or a joint vocational school established pursuant to ORC Section 3311.18, performing essential governmental functions of state government pursuant to ORC Sections 3318.01 to 3318.20.



<b>School District Board</b>	The board of education of a School District.
<b>Separate Consultant</b>	A Person engaged by the Owner or Contracting Authority to provide Project-related professional services other than the services under this Contract. The term includes the Separate Consultant's authorized representatives, successors, assigns, and subconsultants regardless of tier.
<b>Separate Contract</b>	The contract between the Owner or Contracting Authority and a Separate Consultant or a Separate Contractor.
<b>Separate Contractor</b>	A Person under contract with the Owner or Contracting Authority to provide Project-related work other than the Work under this Contract. The term includes the Separate Contractor's authorized representatives, successors, assigns, and subcontractors regardless of tier.
<b>Shop Drawings</b>	Drawings, diagrams, illustrations, and schedules specifically prepared for the Project provided by the Contractor or a Subcontractor to illustrate some portion of the Work. Shop Drawings are not Contract Documents. Shop Drawings on equipment shall include a written statement from the manufacturer of the equipment certifying the equipment is in compliance with the Contract Documents.
<b>Site</b>	The location designated for the Project.
<b>Specifications</b>	Those portions of the Contract Documents consisting of detailed written administrative, procedural, and technical requirements, included in Divisions 01 through 49, for the construction of the Work, whether physically on the Drawings or bound in separate volumes, including identification of acceptable materials, methods, equipment, quality, and workmanship.
<b>Stage</b>	A distinct period in the life cycle of a facility from concept through construction, to use and deconstruction or demolition. Typical Stages include Program Verification, Schematic Design, Design Development, Construction Documents, Bidding and Award stages; and the Construction Stage, which includes Construction and Closeout activities.
<b>Standard Requirements</b>	The brief name of the "State of Ohio Standard Requirements for Public Facility Construction," including but not limited to General Conditions, and other Division 00 Documents and Division 01 Sections; currently in effect, which the Commission may modify from time to time.
<b>State</b>	The government of Ohio, including any organized body, office, or agency established by the laws of this state for the exercise of any function of state government, any state institution of higher education as defined in ORC Section 3345.011, or any School District Board as defined in ORC Section 3318.01.
<b>Subcontract</b>	Any contract or agreement between the Contractor and a Subcontractor for performance of a portion of the Work.
<b>Subcontract Form</b>	The <b>State of Ohio Subcontract Form</b> prescribed by OAC Section 153:1-3-02 and required for use with the General Contracting method of project delivery.
<b>Subcontractor</b>	A Person who undertakes to perform any part of the Work on the Project under a contract with a Contractor or with any Person other than the State, including all such Persons in any tier. The term "Subcontractor" includes Material Suppliers, but does not include any Separate Contractor unless expressly assigned in writing to the Contractor by the Owner and accepted by the Contractor.
<b>Substantial Completion</b>	The stage in the progress of the Work when the Work (or designated portion of the Work for which the Contracting Authority and Owner have agreed to take Partial Occupancy) is sufficiently complete in accordance with the Contract that the Owner can utilize the Work for its intended use, as determined by the A/E. The issuance of a certificate of occupancy or partial certificate of occupancy (if applicable) is a condition precedent to the achievement of Substantial Completion.
<b>Substantially Complete</b>	See "Substantial Completion."

<b>Substitution</b>	An article, device, material, equipment, form of construction, or other item, proposed by a prospective Bidder prior to the bid opening and approved by the A/E by Addendum, for incorporation or use in the Work as being functionally and qualitatively equivalent to essential attributes of a Basis of Design or Acceptable Component specified in the proposed Contract Documents.
<b>Supplementary Conditions</b>	Amendments to the General Conditions, issued as a separate document, which describe conditions of the Contract unique to a particular Owner or Project, which may include provisions regarding the assignment of responsibility for refuse removal, safety and security precautions and programs, temporary Project facilities and utilities, weather and fire protection, scaffolding and equipment, materials and services to be used commonly by the Contractor and Subcontractors and requiring the Contractor to provide assistance in the utilization of any applicable equipment system, preparation of operation and maintenance manuals, and training of Owner personnel for operation and maintenance of the Project. The General Conditions shall not be superseded or amended by Drawings and Specifications, unless so provided in Supplementary Conditions prepared by the Contracting Authority and approved by the Commission.
<b>Supplementary Instructions</b>	Amendments to the Instructions to Bidders, issued as a separate document, which describe instructions unique to a particular Owner or Project. The Instructions to Bidders shall not be superseded or amended by Drawings and Specifications, unless so provided in Supplementary Instructions prepared by the Contracting Authority and approved by the Commission.
<b>Surety</b>	A Person providing a Bid Guaranty or a Bond to a Bidder or a Contractor, as applicable, to indemnify the State against all direct and consequential damages suffered by failure of the Bidder to execute the Contract, or of the Contractor to perform the Contract and to pay all lawful claims of Subcontractors, Material Suppliers and laborers, as applicable.
<b>Systems Manual</b>	A system focused composite document that includes the operation manual, maintenance manual, and additional information of use to the Owner after they begin using the facility.
<b>Unit Price</b>	The cost of providing a unit of Work including labor, materials, services, and associated expenses. Unit Prices do not include the Contractor's Fee on account of the associated Unit Price Work.
<b>Work</b>	The labor, materials, equipment, and services, individually or collectively which are required by the Contract Documents, to be performed or provided by the Contractor for the Project. The furnishing of all material, labor, detailing, layout, supplies, plants, tools, scaffolding, transportation, temporary construction, superintendence, demolition, and all other services, facilities and items reasonably necessary for the full and proper performance and completion of the requirements of the Project as set forth in the Contract Documents, and items reasonably inferable therefrom and consistent therewith for the proper execution and completion of the construction and other services required by the Contract Documents, whether provided or to be provided by the Contractor or a Subcontractor, or any other entity for whom the Contractor is responsible, and whether or not performed or located on or off of the Site.

**END OF DOCUMENT**



**Document 00 72 13 - General Conditions (General Contracting Project)**  
**State of Ohio Standard Requirements for Public Facility Construction**

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**ARTICLE 1 - CONTRACTOR'S RESPONSIBILITIES**

**1.1 Nondiscrimination**

**1.1.1** The Contractor shall comply with Applicable Law regarding equal employment opportunity, including ORC Section 153.59 and all Executive Orders issued by the Governor of the state of Ohio.

**1.1.1.1** As required under ORC Section 153.59, the Contractor agrees to both of the following:

- .1** "in the hiring of employees for the performance of work under the contract or any subcontract, no contractor, subcontractor, or any person acting on a contractor's or subcontractor's behalf, by reason of race, creed, sex, disability or military status as defined in section 4112.01 of the Revised Code, or color, shall discriminate against any citizen of the state in the employment of labor or workers who is qualified and available to perform the work to which the employment relates; and"
- .2** "no contractor, subcontractor, or any person on a contractor's or subcontractor's behalf, in any manner, shall discriminate against or intimidate any employee hired for the performance of work under the contract on account of race, creed, sex, disability or military status as defined in section 4112.01 of the Revised Code, or color."

**1.1.1.2** The Contractor shall cooperate fully with the State's Equal Opportunity Coordinator ("EOC"), with any other official or agency of the state or federal government that seeks to eliminate unlawful employment discrimination, and with all other state and federal efforts to assure equal employment practices under the Contract.

**1.1.1.3** In the event the Contractor fails to comply with these nondiscrimination clauses, the Contracting Authority shall deduct from the amount payable to the Contractor a forfeiture of the statutory penalty pursuant to ORC 153.60 for each person who is discriminated against or intimidated in violation of this **Section 1.1.1**.

**1.1.1.4** The Contract may be terminated or suspended in whole or in part by the Contracting Authority and all money to become due hereunder may be forfeited in the event of a subsequent violation of this **Section 1.1.1**.

**1.1.2 Hiring Under State Public Improvement Contracts.**

**1.1.2.1** Any provision of a hiring hall contract or agreement which obligates the Contractor to hire, if available, only employees referred to the Contractor by a labor organization shall be void as against public policy and unenforceable with respect to employment under any public improvement contract unless at the date of execution of the hiring hall contract or agreement, or within 30 days thereafter, the labor organization has procedures in effect for referring qualified employees for hire without regard to race, color, religion, national origin, military status as defined in ORC Section 4112.01, or ancestry and unless the labor organization includes in its apprentice and

journeyperson's membership, or otherwise has available for job referral without discrimination, qualified employees, both whites and non-whites (including African-Americans).

### **1.1.3 Affirmative Action.**

**1.1.3.1** The Contractor and Subcontractors shall comply with the State's Equal Employment Opportunity requirements described under OAC Sections 123:2-3 through 123:2-9 that include, without limitation, the requirements described under this **Section 1.1.3**.

**1.1.3.2** The Contractor shall demonstrate its good faith efforts to comply with the utilization goals currently established for minority and women employees and submit documentation to the EOC.

**1.1.3.3** By the 10th day of each month, the Contractor and Subcontractors shall submit to the EOC via the internet a completed Ohio Construction Contract Information Report - Input Form 29 (I-29) for the preceding month. The form shall be submitted through the Ohio Business Gateway: <http://business.ohio.gov/efiling/>.

## **1.2 Prevailing Wages**

**1.2.1** The Contractor shall comply with the prevailing wage requirements described under ORC Chapter 4115 that include, without limitation, the requirements described under this **Section 1.2**.

**1.2.2** If the Project is subject to payment of prevailing wage rates, the Contractor shall:

**1.2.2.1** pay to laborers and mechanics performing Work on the Project the prevailing wage rates of the Project locality, as determined by the Ohio Department of Commerce, Wage and Hour Bureau;

**1.2.2.2** post in a prominent place readily accessible by all workers on the Site, a legible listing of the current classifications of laborers, workers, and mechanics employed under this Contract;

**1.2.2.3** ensure that the rates posted are current and remain posted in legible condition during the period of the Contract; and

**1.2.2.4** not be entitled to an increase in the Contract Sum on account of an increase in prevailing wage rates, except as otherwise provided by Applicable Law.

**1.2.3** The Contractor may access the Ohio Department of Commerce, Wage & Hour Bureau at its website, <https://wagehour.com.ohio.gov/w3/webwh.nsf/wrlogin/?openform>, to obtain the current wage rates.

## **1.3 Royalties and Patents**

**1.3.1** The Contractor shall pay all royalties, license fees, and assume all costs incident to the use, in the performance of the Work or the incorporation in the Work, of any invention, design, process, product, or device that is the subject of patent rights or copyrights held by others.

**1.3.2** If the Contractor has reason to believe that use of the specified item is subject to patent or copyright protection, the Contractor shall immediately notify the Contracting Authority.

## **1.4 Assignment of Antitrust Claims**

**1.4.1** By signing the Agreement, the Contractor assigns, conveys and transfers to the Contracting Authority any right, title, and interest to any claims or causes of action it may have or acquire under state or federal antitrust laws relating to any goods, products, or services purchased, procured, or rendered to the State pursuant to the Contract.

## **1.5 Use of Domestic Steel**

**1.5.1** The Contractor is required by law to supply domestically produced steel products used for load bearing structural purposes on all projects funded in whole or in part with State funds.

**1.5.2** The Contractor and Subcontractors shall comply with ORC Section 153.011 regarding the use of domestically produced steel products, and furnish the certifications required by **Section 6.20.8**. Copies of [ORC Section 153.011](#) may be obtained from the Ohio Facilities Construction Commission.

## **1.6 Drug Free Safety Program Participation**

**1.6.1** Throughout the performance of the Work, the Contractor shall be enrolled in and remain in good standing in the Ohio Bureau of Workers' Compensation ("OBWC") Drug-Free Safety Program ("DFSP") or a comparable program approved by the OBWC that meets the requirements specified in ORC Section 153.03 ("OBWC-approved DFSP").

**1.6.2** As required under ORC Section 153.03(E):

**1.6.2.1** “Each contractor shall require all subcontractors with whom the contractor is in contract for the public improvement to be enrolled in and be in good standing in the Bureau of Workers’ Compensation’s Drug-Free Workplace Program or a comparable program approved by the Bureau that meets the requirements specified in section 153.03 of the Revised Code prior to a subcontractor providing labor at the project site of the public improvement.”

**1.6.2.2** “Each subcontractor shall require all lower-tier subcontractors with whom the subcontractor is in contract for the public improvement to be enrolled in and be in good standing in the Bureau of Workers’ Compensation’s Drug-Free Workplace Program or a comparable program approved by the Bureau that meets the requirements specified in section 153.03 of the Revised Code prior to a lower-tier subcontractor providing labor at the project site of the public improvement.”

**1.6.2.3** “Failure of a contractor to require a subcontractor to be enrolled in and be in good standing in the Bureau of Workers’ Compensation’s Drug-Free Workplace Program or a comparable program approved by the Bureau that meets the requirements specified in section 153.03 of the Revised Code prior to the time that the subcontractor provides labor at the project site will result in the contractor being found in breach of the contract and that breach shall be used in the responsibility analysis of that contractor or the subcontractor who was not enrolled in a program for future contracts with the State for 5 years after the date of the breach.”

**1.6.2.4** “Failure of a subcontractor to require a lower-tier subcontractor to be enrolled in and be in good standing in the Bureau of Workers’ Compensation’s Drug-Free Workplace Program or a comparable program approved by the Bureau that meets the requirements specified in section 153.03 of the Revised Code prior to the time that the lower-tier subcontractor provides labor at the project site will result in the subcontractor being found in breach of the contract and that breach shall be used in the responsibility analysis of that subcontractor or the lower-tier subcontractor who was not enrolled in a program for future contracts with the State for 5 years after the date of the breach.”

**1.6.3** Prior to authorizing a Subcontractor to commence Work on the Site, the Contractor shall obtain the Contracting Authority’s approval, and shall also submit written confirmation of the Subcontractor’s enrollment on the **Subcontractor and Material Supplier Declaration** form to the A/E.

**1.6.4** In addition to OBWC-approved DFSP Basic requirements, the Contractor, each Subcontractor, and each Separate Contractor that provides labor on the Site shall participate in a pool that performs random drug testing of at least 5 percent of its employees who perform labor on the Site. The random drug testing percentage shall also include the on-site supervisors of the Contractor, Subcontractors, and Separate Contractors. Basic random drug testing shall otherwise comply with the same testing guidelines and criteria as required for OBWC-approved advanced testing. The Contractor and Subcontractor shall provide evidence of required testing to the Contracting Authority upon request.

**1.7 Use of the State’s Web-based Project Management Software**

**1.7.1** If the Contracting Authority decides, in its sole discretion, to utilize the State’s web-based project management software for the Project, the Contractor shall use such software for all compatible services required under this Contract.

**1.7.2** All costs for the Contractor’s use of the State’s web-based project management software for the Project shall be included in the Contract Sum. If the Contractor is unfamiliar with the proper use of such software, the Contractor shall provide its employees for training without additional compensation.

**1.8 EDGE Participation and Reporting**

**1.8.1** The Contractor shall participate in the “Encouraging Diversity, Growth and Equity” (“EDGE”) Program by subcontracting with, and using one or more, businesses certified as an EDGE Business Enterprise (“EDGE-certified Business”) by the EOC.

**1.8.1.1** If the Contractor is an EDGE-certified Business, the Contractor may include its own compensation under this Contract in the reporting.

**1.8.1.2** The amount of EDGE participation cannot exceed 100 percent of the Contract Sum.

**1.8.1.3** The Contractor shall include in the reporting only those expenditures to EDGE-certified Businesses that perform a commercially useful function as described in OAC Section 123:2-16-15.

**1.8.2** The Contractor shall provide an EDGE Participation Report with each Contractor Payment Request.

**1.8.2.1** The Contractor shall provide status reports, produced by the Contractor and each applicable EDGE-certified Business for the Contract, indicating:

- .1 the name of each EDGE-certified Business;
- .2 the federal tax identification number of each EDGE-certified Business;
- .3 the date of the EDGE-certified Business contract, Subcontract, or purchase order;
- .4 the projected and actual start and end dates of the EDGE-certified Business contract, Subcontract, or purchase order;
- .5 the original amount of the EDGE-certified Business contract, Subcontract, or purchase order with the Contractor;
- .6 the current amount of the EDGE-certified Business contract, Subcontract, or purchase order;
- .7 the amount invoiced to date;
- .8 the amount paid to date;
- .9 the status of the EDGE-certified Business contract, Subcontract, or purchase order (active, complete, or void); and
- .10 a statement describing any substantive product or performance deficiencies.

**1.8.2.2** The Contractor shall provide reports for each EDGE-certified Business; however, the reports may be consolidated and submitted as one document.

**1.8.3** The Contractor shall provide an EDGE Participation Final Report simultaneously with its final Contractor Payment Request.

**1.8.3.1** The Contractor and each EDGE-certified Business shall provide in the report certification that the submitted document is a true and accurate accounting of the original contract amount paid to, and received by, each EDGE-certified Business.

**1.8.4** The Contractor shall provide the EDGE Participation Reports in detail and form acceptable to the Contracting Authority.

**1.8.4.1** Failure to timely submit EDGE Participation Reports may result in withholding payment in accordance with **Section 9.8**.

**1.8.5** If the Project is administered using the State's web-based project management software, the Contractor shall submit its EDGE Participation Reports, using the "Contractor Pay Request" (Agency/Higher Education) or "Applications for Payment" (School Facilities) business process.

**1.8.6** The Contractor shall cooperate fully with requests for additional EDGE information and documentation from the EOC or Contracting Authority.

## **1.9 Owner Work Rules**

**1.9.1** The Contractor shall consult with the Owner to obtain full knowledge of the Owner's rules, regulations, or requirements affecting the Project.

## **1.10 Emergency**

**1.10.1** In the event of an emergency affecting the safety of the Project, other property, or individuals, the Contractor, without special instruction or authorization, shall act to prevent the threatened damage, injury, or loss.

**1.10.2** If the Contractor believes that it is entitled to an adjustment of the Contract Sum or Contract Times, or both, on account of its actions in response to an emergency, the Contractor may request a Modification by giving written notice under **Section 7.3.2**.

## **1.11 Contractor's Standard of Care**

**1.11.1** The Contractor shall perform the Work in a workmanlike manner, consistent with the standards of skill and care exercised by entities licensed to perform (where required under Applicable Law) and regularly performing comparable work in the same or similar locality under the same or similar circumstances.

## **1.12 Limit of Contractor's Responsibility**

**1.12.1** The Contractor is not responsible for the A/E's negligence or the A/E's failure to properly perform the A/E's contract.

### 1.13 Sustainability Requirements

**1.13.1** This Project shall be designed and constructed in accordance with the requirements of Am. Sub. H.B. 251 of the 126<sup>th</sup> General Assembly and the resulting rules, policies, and procedures adopted by the Ohio Facilities Construction Commission establishing Sustainability Requirements for Capital Improvements Projects, including but not limited to the applicable provisions of OAC 3318-3.

**1.13.2** If the Project is designed and constructed under the Leadership in Energy and Environmental Design (“LEED”) Rating System developed by the U.S. Green Building Council or another rigorous rating system used to facilitate achievement of sustainability goals for the Project, the Contractor shall provide submittals certifying achievement of sustainable design rating system criteria for verification by the Green Building Certification Institute or other third party in accordance with the Contract Documents.

## ARTICLE 2 - STATE’S RIGHTS AND RESPONSIBILITIES

### 2.1 Contracting Authority

**2.1.1** The Contracting Authority shall designate a Project Manager for the Project. The Project Manager is authorized to act on behalf of the Contracting Authority to perform specific responsibilities under the Contract.

**2.1.2** The Contracting Authority shall furnish information and services required of it in a timely manner.

**2.1.3** The Contracting Authority shall have access to the Work at all times, whenever the Project is in preparation or progress.

**2.1.4** The Ohio Facilities Construction Commission requires use of its forms where indicated in the Contract Documents. The party responsible for initiating forms shall utilize the latest edition obtained from the Commission’s website: <http://ofcc.ohio.gov>. The Commission may make modifications to its forms at any time.

**2.1.4.1** The Contractor shall not modify any form provided by the Commission or Contracting Authority.

**2.1.4.2** If the Project is administered using the State’s web-based project management software, the Contractor shall utilize the web-based forms and reports within the applicable business process. The State’s web-based project management software is sponsored by the Commission, and such web-based forms and reports are acceptable to the Commission in lieu of its paper forms.

**2.1.5** The Contracting Authority is not responsible for construction means, methods, manners, techniques, sequences, procedures, or for safety precautions and programs in connection with the Work, or for the Contractor’s failure to carry out the Work in conformity with the Contract Documents.

### 2.2 Owner

**2.2.1** The Owner shall designate a representative authorized to act on behalf of the Owner during the Project.

**2.2.2** The Owner shall furnish information and services required of it in a timely manner.

**2.2.3** The Owner shall have access to the Work at all times whenever the Project is in preparation or progress.

**2.2.4** Upon issuance of the Notice to Proceed, the Owner shall provide the Site to the Contractor in a condition to permit the Contractor to perform the Work.

**2.2.5** The Owner may request a change in the Work if the A/E recommends and the Contracting Authority approves the change.

**2.2.6** The Owner shall communicate with the Contractor through the Contracting Authority.

**2.2.7** The Owner is not responsible for construction means, methods, manners, techniques, sequences, procedures, or for safety precautions and programs in connection with the Work, or for the Contractor’s failure to carry out the Work in conformity with the Contract Documents.

### 2.3 Approval of Owner, Contracting Authority, and State

**2.3.1** The Owner, Contracting Authority, or State’s review and approval of the Work and any information the Contractor submits to them is for the sole purpose of determining whether the Work and information are generally consistent with the Contract’s intent, and will not relieve the Contractor of its sole responsibility for the performance, preparation, completeness, and accuracy of the Work and information.



## 2.4 Neutral Facilitation

**2.4.1** The Contracting Authority or Owner may engage a Neutral Facilitator for the purposes of **(1)** building cooperative relationships among the Project participants to achieve discrete objectives; **(2)** encouraging educated, productive, and expedited attempts to avoid, minimize, and resolve disputes; and **(3)** maximizing the effectiveness of each participant's resources.

**2.4.1.1** For example, a Neutral Facilitator may facilitate the organizational meeting, partnering session(s), and efforts to resolve disputes throughout the Project.

**2.4.2** The Contracting Authority, Owner, and Contractor are entitled to interact with the Neutral Facilitator with the full expectation that **(1)** they may act, speak, and disclose information with complete candor and **(2)** all communication, whether oral or written, made in the course of facilitated sessions is confidential.

**2.4.3** At any hearing or proceeding regarding any dispute arising out of or related to the Project **(1)** the Neutral Facilitator will not be competent to testify and shall not be called as a witness and **(2)** the Neutral Facilitator's testimony and work product will not be admissible.

**2.4.4** The Neutral Facilitator will not **(1)** perform any services with respect to or bear any responsibility for any legal services, design-professional services, construction, or construction management associated with the Project or **(2)** have any liability whatsoever for any claims related to any legal services, design-professional services, construction, or construction management associated with the Project, including without limitation, claims for legal or design-professional errors or omissions, delays, cost overruns, faulty construction, or increased costs.

**2.4.5** The Neutral Facilitator's participation in the Project will not relieve the Contracting Authority, Owner, and Contractor of any of their respective rights or obligations under the Contract.

## 2.5 Contractor Performance Evaluation

**2.5.1** The Contracting Authority may evaluate the Contractor's performance during the progress of the Work, at completion of a phase of the Project, completion of the Project, or any of the foregoing. The Contracting Authority shall retain the evaluation(s).

**2.5.1.1** The Contractor may request a copy of the completed evaluation(s). If the Contractor wishes to comment or take exception to any rating or remark, the Contractor must send a response in writing to the Contracting Authority within 30 days of receiving the evaluation(s).

**2.5.1.2** The Contracting Authority may use the evaluation(s) in determining the responsibility of the Contractor for award of future contracts.

**2.5.1.3** The Contracting Authority may request information from the Contractor for use in evaluating the A/E's performance. If information is requested, the Contractor must comply in a timely and responsive manner.

**2.5.1.4** If a breach of the Contract is committed by the Contractor or is attributable to a Subcontractor, that breach will be used in the responsibility analysis of the Contractor and Subcontractor (where applicable) for future contracts with the State or subcontracts on State projects for 5 years after the date of the breach.

**2.5.1.5** If the Project is administered using the State's web-based project management software, the Contractor shall receive and review the Contracting Authority's evaluation of the Contractor's performance and respond with its comments, using the "Contractor Evaluation" business process.

## ARTICLE 3 - A/E'S RESPONSIBILITIES

### 3.1 The A/E's Contract Administration Duties

**3.1.1** The A/E shall administer the Contract as provided in the Contract Documents and Architect/Engineer Agreement, including, but not limited to, performance of the functions described as follows:

**3.1.1.1** The A/E shall attend and conduct progress meetings. The A/E shall prepare an agenda and produce a written report of each progress meeting, and distribute the report to the Contracting Authority, Owner, and Contractor within 3 business days after the meeting. The A/E shall not delegate the duty to prepare the agenda and written reports of any progress meeting.

**3.1.1.2** The A/E may authorize minor changes or alterations in the Work that are consistent with the intent of the Contract Documents and do not involve adjustment of the Contract Sum or Contract Times, or both. The A/E has no authority to authorize the Contractor to perform additional or extra Work for which the Contractor may seek adjustment of the Contract Sum or Contract Times, or both.

**3.1.1.3** The A/E shall review and recommend, certify, or approve applicable forms required under the Contract Documents.

**3.1.1.4** The A/E shall render decisions in connection with the Contractor's responsibilities under the Contract Documents, and submit recommendations to the Contracting Authority for enforcement of the Contract as necessary.

**3.1.2** The A/E is the initial interpreter of all requirements of the Contract Documents. All decisions of the A/E are subject to final determination by the Contracting Authority.

### **3.2 Site Visits and Observation**

**3.2.1** The A/E shall notify, advise, and consult with the Contracting Authority and Owner and protect the State against Defective Work throughout completion of the Project, which includes the Correction Period.

**3.2.1.1** The A/E shall designate a field representative, subject to the Contracting Authority's approval, to attend to the Project, to observe and check the progress and quality of the Work, and to take action as necessary or appropriate to achieve conformity with the Contract Documents.

**3.2.1.2** The A/E shall have its consultants attend to the Project at intervals required by its agreement or the Contracting Authority.

**3.2.2** The A/E is authorized to disapprove or reject Defective Work. The A/E shall immediately notify the Contracting Authority any time the A/E disapproves or rejects an item of Work.

**3.2.3** The A/E is not responsible for construction means, methods, manners, techniques, sequences, procedures, or for safety precautions and programs in connection with the Work, or for the Contractor's failure to carry out the Work in conformity with the Contract Documents.

### **3.3 Testing and Inspection Services**

**3.3.1** Unless otherwise specified in the Contract Documents, the A/E shall apply for, secure, and pay for the costs of structural testing and special inspections under Chapter 17 of the Ohio Building Code; testing including geotechnical analysis, environmental testing and analysis, concrete, masonry, structural steel, reinforcing steel, welding, bolts, steel connections, HVAC systems and controls, plumbing and piping, air and water balancing and testing, or other testing; or approval required by Applicable Law.

### **3.4 Approval of A/E**

**3.4.1** The A/E's review and approval of the Work and any information the Contractor submits to the A/E is for the sole purpose of determining whether the Work and information are generally consistent with the Contract's intent, and will not relieve the Contractor of its sole responsibility for the performance, preparation, completeness, and accuracy of the Work and information.

### **3.5 Limitation of A/E's Authority**

**3.5.1** Under no circumstances is the A/E authorized to:

**3.5.1.1** bind the Owner or Contracting Authority to any authorizations under, modifications of, or amendments to any contract other than as expressly described under **Section 3.1.1.2**;

**3.5.1.2** accept any defective or non-conforming services, Work, or vendor-furnished items;

**3.5.1.3** make any settlements on behalf of the Owner or Contracting Authority; or

**3.5.1.4** assume any responsibilities of the Contractor or Subcontractors.

## **ARTICLE 4 - SUBCONTRACTORS**

### **4.1 Evaluation and Approval**

**4.1.1** Within 10 days after the Notice to Proceed, or other period as mutually agreed by the Contractor and Contracting Authority, the Contractor shall submit to the A/E a **Subcontractor and Material Supplier Declaration** form through which the Contractor identifies its Subcontractors.

**4.1.2** The Contractor's failure to timely submit the information regarding a proposed Subcontractor may result in withholding payment in accordance with **Section 9.8**.

**4.1.3** After receiving the **Subcontractor and Material Supplier Declaration** form, the A/E shall verify that it is complete and deliver it to the Contracting Authority and Owner. If the A/E finds the form incomplete, the A/E shall return it to the Contractor and identify the incomplete information.

**4.1.4** If the Contracting Authority rejects any proposed Subcontractor, the Contractor shall propose a replacement Subcontractor with no adjustment of the Contract Sum. The proposed replacement Subcontractor will be evaluated as described above.

**4.1.5** No less than 10 days before Work is to be performed by the Subcontractor, or within a shorter period as mutually agreed by the Contractor and Contracting Authority, the Contractor shall submit to the Contracting Authority a complete copy of the executed Subcontract between the Contractor and Subcontractor.

**4.1.6** If the Project is administered using the State's web-based project management software, the Contractor shall identify its proposed Subcontractors and submit its Subcontracts through the "Subcontractor Supplier Declaration" business process.

## **4.2 Form of Subcontract**

**4.2.1** All Subcontracts shall be on the **State of Ohio Subcontract Form** prescribed by OAC Section 153:1-03-02.

**4.2.2** No less than 10 days before Work is to be performed by a Subcontractor, or within a shorter period as mutually agreed by the Contractor and Contracting Authority, the Contractor shall submit to the Contracting Authority and A/E a complete copy of the executed Subcontract between the Contractor and Subcontractor. After receiving the Subcontract, the A/E shall verify that it is complete and deliver it to the Contracting Authority. If the A/E finds the Subcontract incomplete, the A/E shall return it to the Contractor and identify the incomplete information.

## **4.3 Replacement of Subcontractors**

**4.3.1** The Contractor shall not replace any Subcontractor after execution of the Subcontract without the prior written approval of the Contracting Authority.

## **4.4 Contractor's Responsibility**

**4.4.1** The Contractor is fully responsible for all acts and omissions of its Subcontractors and is responsible for scheduling and coordinating the Work of its Subcontractors.

**4.4.1.1** The Contractor is fully responsible for any delay, interference, disruption, or hindrance attributable to the Contractor's Subcontractors.

**4.4.1.2** The Contractor shall require that each of its Subcontractors have a competent supervisor at the Site whenever the Subcontractor is performing Work.

**4.4.1.3** The Contractor shall bind its Subcontractors to the terms of the Contract Documents, so far as applicable to the Work of the Subcontractor, and shall not agree to any provision, which seeks to bind the State to terms inconsistent with or at variance from the Contract Documents.

**4.4.2** The Contractor will not be relieved of its full responsibility for Subcontractors and their performance of the Work by (1) the participation of the Owner, Contracting Authority, and A/E in the processes described under this **Article 4** or other related provisions of the Contract Documents or (2) the Contracting Authority's rejection of a Subcontractor or failure to reject a Subcontractor under **Section 4.1**.

## **4.5 Contingent Assignment of Subcontracts**

**4.5.1** The Contractor hereby assigns its agreement with each Subcontractor to the Contracting Authority provided that the assignment is effective only after termination of the Contract by the Contracting Authority and only for those agreements that the Contracting Authority accepts by notifying the Contractor and applicable Subcontractor in writing. The Contracting Authority may re-assign accepted agreements.

## **4.6 Prompt Payment**

**4.6.1** The Contractor shall make payments to Subcontractors in accordance with Applicable Law, including ORC Section 4113.61 that include, without limitation, the requirements described under this **Section 4.6**.

**4.6.1.1** If a Subcontractor requests payment in time to allow the Contractor to include the request in its Contractor Payment Request, the Contractor shall pay within 10 days after receipt of payment from the State:

- .1** To a Subcontractor other than a Material Supplier, an amount equal to the percent of completion allowed by the Contracting Authority for the Subcontractor's Work.

- .2 To a Material Supplier, an amount equal to all or that portion of the Contractor Payment Request that represents the materials furnished by the Material Supplier.

**4.6.2** The Contractor may reduce the amount paid to a Subcontractor pursuant to **Section 4.6.1** at a rate equal to the percentage retained from the Contractor and may withhold amounts necessary to **(1)** resolve disputed liens or claims involving the Work of the Subcontractor or **(2)** account for the failure of the Subcontractor to perform its obligations under its agreement with the Contractor.

**4.6.2.1** Labor Payments.

- .1 Partial payments to the Subcontractor for labor performed under either a Unit Price or lump sum Subcontract shall be made at the rate of 92 percent of the amount invoiced through the Subcontractor's request for payment that shows the Work of the Subcontractor is 50 percent complete.
- .2 After the Work of the Subcontractor is 50 percent complete, as evidenced by payments of at least 50 percent of the total amount due under the Subcontract, no additional funds shall be retained from payments for labor.

**4.6.2.2** Material Payments.

- .1 The Contractor shall pay the Subcontractor at the rate of 100 percent of the scheduled value for materials incorporated into the Project.
- .2 The Contractor shall pay the Subcontractor at the rate of 92 percent of the invoice cost, not to exceed the scheduled value in a Unit Price or lump sum Subcontract, for materials delivered to the Site, or other off-site storage location approved by the A/E, provided the Subcontractor provides the information required by **Sections 9.6.2.1** and **9.6.2.2** with its request for payment.

**4.6.3** If the Contractor fails to comply with this **Section 4.6**, the Contractor shall pay to the applicable Subcontractor 18 percent interest, compounded annually, on any unpaid amount beginning on the 11th day after receipt of payment from the State.

**4.6.4** In order to establish lien rights, Subcontractors shall comply with Applicable Law, including ORC Sections 1311.26, 1311.261, and 1311.29.

**4.6.5** If the Contracting Authority receives a Claim Affidavit from a Subcontractor, it shall proceed as required by Applicable Law, including ORC Sections 153.63 and 1311.31.

**4.6.6** Laborers, Subcontractors, and Material Suppliers may secure payment rights in accordance with Applicable Law, including ORC Section 153.56.

## **ARTICLE 5 - PRECONSTRUCTION ACTIVITIES**

### **5.1 Partnering**

**5.1.1** The formation of a cohesive, mutually beneficial partnering arrangement among the Contractor, Contracting Authority, A/E, and Owner will accomplish the construction of the Project most effectively and efficiently. This arrangement draws on their collective strengths, skills, and knowledge to achieve a Project of the intended quality, within budget, and on schedule. To achieve that objective, participation in a partnering session is required for the following key stakeholders:

- 5.1.1.1** Contracting Authority: Project Manager
- 5.1.1.2** Owner: Primary representative
- 5.1.1.3** A/E: Principal-in-charge, project manager, field representative, major consultants
- 5.1.1.4** Contractor: Principal-in-charge, project manager, and superintendent
- 5.1.1.5** Major Subcontractors (e.g., plumbing, HVAC, electrical): Principal-in-charge, project manager or superintendent
- 5.1.1.6** CxA, if applicable

**5.1.2** The purpose of the partnering arrangement is to build cooperative relationships between the Project's key stakeholders, avoid or minimize disputes, and nurture a more collaborative ethic characterized by trust, cooperation and teamwork. This arrangement is intended to produce a voluntary, non-binding, but formally structured agreement among the Project's key stakeholders, leading to an attitude that fosters risk sharing.

**5.1.3** To create and implement the partnering arrangement, the Project's key stakeholders shall meet prior to the construction of the Project for developing a partnering agreement. The agreement should be comprehensive and focus on all issues necessary for successful completion of the Project, and shall identify common goals and objectives, develop a problem solution process, an Alternative Dispute Resolution ("ADR") strategy in accordance with **Section 8.13**, and an implementation plan for the partnering arrangement.

**5.1.4** Formal contractual relations, responsibilities, and liabilities are not affected by any partnering arrangement. The cost associated with establishing this partnership, including but not limited to engaging the services of a Neutral Facilitator, shall be included in an allowance in the Contractor's bid. The Contractor shall include in its base bid the resources necessary to participate in the partnering session.

**5.1.5** Partnering services may extend over the entire period of performance of the Contract and may include intervention or project realignment services to be utilized if serious disputes arise. The Project's key stakeholders should agree, during the initial partnering session, to the types of situations and circumstances in which intervention or realignment services shall be utilized.

## **5.2 Building and Trade Permits and Licenses**

### **5.2.1 Plan Approval.**

**5.2.1.1** The A/E shall secure the required structural, plumbing, HVAC, and electrical plan approvals.

**5.2.1.2** The Contractor shall schedule and attend all intermediate and final inspections required for any permit applicable to the Work. The Contractor shall schedule the State Fire Marshal or local fire authority for the life safety inspection for occupancy permits. The Contractor shall give the A/E, Contracting Authority, and Owner reasonable notice of the dates and times arranged for inspections.

- .1 The Contractor shall pay for any reinspections required as a result of the Contractor's failure to receive approval of its Work.

### **5.2.2 Trade Permits and Licenses.**

**5.2.2.1** The Contractor shall obtain, maintain, and pay for any permit, inspection, or license applicable to the Contractor's particular trade.

### **5.2.3 Local Permits.**

**5.2.3.1** The Contractor shall secure and pay the fees for any permits, inspections, licenses, capacity charges, or tap fees required by local authorities having jurisdiction over the Project. The Contractor shall give the A/E, Contracting Authority, and Owner reasonable notice of the date arranged for inspections.

### **5.2.4 National Pollutant Discharge Elimination System ("NPDES") Storm Water General Permit.**

**5.2.4.1** The A/E shall secure the NPDES general permit by submitting a Notice of Intent ("NOI") application form to the Ohio Environmental Protection Agency at least 45 days prior to the start of construction. The Contractor shall be a "co-permittee" if required under Applicable Law.

**5.2.4.2** The A/E shall prepare and certify a storm water pollution prevention plan to provide sedimentation and erosion controls at the Project.

**5.2.4.3** The A/E shall prepare and process the required Notice of Termination ("NOT") prior to Contract Completion.

## **ARTICLE 6 - CONSTRUCTION AND CLOSEOUT**

### **6.1 Commencement of Work on the Site**

**6.1.1** Unless the Contracting Authority agrees otherwise in writing, the Construction Stage will commence with the Contracting Authority's issuance of the Notice to Proceed and will terminate upon Contract Completion.

### **6.2 Responsibility of the Contractor**

**6.2.1** The Contractor shall complete portions of the Work in the sequence and time in the Construction Progress Schedule.

**6.2.2** The Contractor shall supervise the Work.

**6.2.3** The Contractor must perform the Work so as not to interfere with, disturb, hinder, or delay the services of Separate Consultants or the work of Separate Contractors. The Contractor must cooperate and coordinate fully with all Separate

Consultants and Separate Contractors and must freely share all of the Contractor's Project-related information with them to facilitate the timely and proper performance of the Work and of the services and work of the Separate Consultants and Separate Contractors.

**6.2.4** The Contractor must afford every Separate Consultant and Separate Contractor proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of their services and work.

**6.2.5** If the Contractor damages the property or work of any Separate Consultant or Separate Contractor, or by failure to perform the Work with due diligence, delays, interferes with, hinders, or disrupts the services of any Separate Consultant or the work of any Separate Contractor who suffers additional expense and damage as a result, the Contractor is responsible for that damage, injury, or expense.

**6.2.6** The intent of **Sections 6.2.3** through **6.2.5** is to benefit the Separate Consultants and Separate Contractors, and to demonstrate that the Separate Consultants and Separate Contractors are intended third-party beneficiaries of the Contractor's obligations under the Contract.

**6.2.7** If the proper execution or results of any part of the Work depends upon work performed or services provided by the Owner, a Separate Consultant, or a Separate Contractor, the Contractor must inspect that other work and appropriate instruments of service, and promptly report to the Contracting Authority in writing any defects or deficiencies in that other work or services that render it unavailable or unsuitable for the proper execution and results of the Work. The Contractor's failure so to report will constitute an acceptance of the other work and services as fit and proper for integration with the Contractor's Work except for defects and deficiencies in the other work or services that were not reasonably discoverable at the time of the Contractor's inspection.

**6.2.8** The Contractor shall not delay the Work on account of any claim, dispute, or action between the Contractor and a Separate Consultant or Separate Contractor.

**6.2.9** The Contractor shall develop and keep current the Construction Progress Schedule in accordance with **Section 6.5**, and prepare and keep current a schedule of submittals that is coordinated with the Construction Progress Schedule, for the A/E and Contracting Authority's acceptance.

**6.2.10** The Construction Progress Schedule shall not exceed the time limits current under the Contract Documents, shall provide for reasonable, efficient, and economical execution of the Project, and shall relate to the entire Project to the extent required by the Contract Documents.

**6.2.11** The Contractor shall use the Construction Progress Schedule to plan, organize, and execute the Project, record and report actual performance and progress, and show how it plans to coordinate and complete all remaining work by Contract Completion.

**6.2.12** The Contractor shall monitor the progress of the Work for conformance with the Construction Progress Schedule and shall initiate revisions as required by **Section 6.5.14**.

**6.2.13** The Contractor shall establish the Project's regular working hours, subject to approval by the A/E and the Owner.

**6.2.14** The Contractor shall coordinate the Work with the activities and responsibilities of the A/E, Owner, and Contracting Authority to complete the Project in accordance with the Contract Documents.

**6.2.15** In the event of default of the Contractor, the Contractor shall cooperate with the A/E, Contracting Authority, and Contractor's Surety to achieve the Substantial Completion date and Contract Completion.

**6.2.16** The Contractor shall remove all snow and ice as may be required for reasonably safe access to the Project including, but not limited to, building entries, driveways, parking lots, and sidewalks.

**6.2.17** The Contractor shall keep a daily log containing a record of weather, number of workers on Site for the Contractor, identification of equipment, Work accomplished, problems encountered, and other similar relevant data.

### **6.3 Construction Procedures**

**6.3.1** The Contractor is solely responsible for and has control over all construction means, methods, manners, techniques, sequences, and procedures, for safety precautions and programs in connection with the Work, and for coordinating all portions of the Work.

**6.3.1.1** If the Contract Documents give instructions that affect construction means, methods, manners, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety of them and, except as stated below, shall

be fully and solely responsible for the jobsite safety of the means, methods, manners, techniques, sequences, or procedures.

**6.3.1.2** If the Contractor determines that the means, methods, manners, techniques, sequences, or procedures specified in the Contract Documents may not be safe, the Contractor shall give timely written notice to the A/E, Owner, and Contracting Authority. The Contractor shall not proceed with that portion of the Work without further written instructions from the A/E. Any modification of the Contract shall be in accordance with **Article 7**.

**6.3.2** The Contractor shall lay out and coordinate all lines, levels, elevations, and measurements for all of the Work, coordinate and verify existing conditions, and notify the A/E of discrepancies and conflicts before proceeding with installation or excavation.

**6.3.3** The Contractor shall perform all cutting, fitting, or patching required for the Work and shall not endanger the Project by cutting, excavating, or otherwise altering the Project, or any part of it.

**6.3.3.1** If the Contractor requires sleeves for the Work, the Contractor shall furnish and install the sleeves. The Contractor is responsible for the exact location and size of all holes and openings required to be formed or built for the Work.

**6.3.3.2** The Contractor's patching shall match and blend with the existing or adjacent surface(s).

**6.3.4** The Contractor shall comply with ORC Sections 3781.25 through 3781.32. In addition, before starting excavation or trenching, the Contractor shall determine the location of any underground utilities and notify any public authority or utility having jurisdiction over the Project and secure any required approval.

**6.3.4.1** The Contractor shall give notice at least 2 business days in advance of excavation to the owners of underground utilities registered with the Ohio Underground Utility Protection Services ("OUPS" at <http://oups.org>, phone 811 or 800-362-2764), and the owners of underground utilities shown on the Drawings and Specifications who are not registered members of OUPS. The owner of an underground utility is required within 48-hours' notice to stake, mark, or otherwise designate the location of its utilities in the construction area together with its approximate depth. In the event that any underground utility owner fails to timely perform, the Contractor shall notify the A/E and contact the owner of the underground utility.

**6.3.5** The Contractor shall install all Work in accordance with the Contract Documents and any installation recommendations of the manufacturer, including required temperature and humidity limits for installation of the various materials.

**6.3.6** The Contractor shall comply with all requirements and conditions of the NPDES general permit, including, but not limited to, implementing and maintaining the sedimentation and erosion control measures specified in the storm water pollution prevention plan prepared by the A/E pursuant to **Section 5.2.4**, which are related to the Work, maintaining records of its construction activities, removing materials no longer required, and taking proper action if there is a reportable quantity spill.

**6.3.7** The Contractor shall communicate with the Contracting Authority and Owner through the A/E.

## 6.4 Construction Supervision

**6.4.1** Unless waived by the Contracting Authority in writing, the Contractor shall provide continuous supervision at the Site by a competent superintendent when any Work is being performed and the Contractor's superintendent shall not be involved with any work other than the Project.

**6.4.2** The Contractor's project manager and superintendent shall each have the responsibility and authority to act on behalf of the Contractor. All communications to the Contractor's project manager or superintendent shall be binding as if given directly to the Contractor.

**6.4.3** The Contractor shall submit an outline of the qualifications and experience of the Contractor's proposed project manager and proposed superintendent, including references, to the Contracting Authority no less than 10 days of the Notice to Proceed. For all Subcontracts in excess of \$200,000, and for all other Subcontracts on request from the Contracting Authority, the Contractor shall submit an outline of the qualifications and experience of the Subcontractor's proposed project manager and proposed superintendent, including references, to the Contracting Authority no less than 10 days before the Subcontractor is scheduled to begin Work on the Site.

**6.4.3.1** The Contracting Authority may reject the Contractor or Subcontractor's proposed project manager or proposed superintendent. If the Contracting Authority does not notify the Contractor of the rejection within 30 days after receiving the required information, it shall indicate that the Contracting Authority has no objection, but does

not affect the Contracting Authority's rights under **Section 6.12.2** or any other provision relative to that project manager or superintendent.

**6.4.3.2** If the Contracting Authority rejects the Contractor or Subcontractor's proposed project manager or proposed superintendent, the Contractor shall replace, or cause the Subcontractor to replace the project manager or superintendent (as appropriate) with someone acceptable to the Contracting Authority at no additional cost.

**6.4.4** The Contractor and its Subcontractors subject to **Section 6.4.3** shall not replace their respective project managers or superintendents without prior written approval of the Contracting Authority.

**6.4.4.1** If the Contractor or a Subcontractor subject to **Section 6.4.3** proposes to change its project manager or superintendent, the Contractor shall submit written justification to the Contracting Authority, along with the name and qualifications of the proposed replacement.

**6.4.4.2** The procedure provided in **Section 6.4.3** shall be conducted to evaluate the Contractor or Subcontractor's (as applicable) proposed replacement project manager or superintendent.

## 6.5 Construction Progress Schedule

**6.5.1** If the Estimated Construction Cost is less than \$500,000, the Contractor may provide a bar chart schedule with a logical sequence of events and sufficient detail to properly anticipate and monitor construction progress. If the Estimated Construction Cost for the Project is \$500,000 or more, the Contractor shall prepare and maintain a resource-loaded Construction Progress Schedule using the critical-path method of scheduling that provides the following information:

**6.5.1.1** a graphic presentation of the sequence of the Work for the Project in the media and format required for the Project;

**6.5.1.2** identification of each stage of the Work and any Milestone dates;

**6.5.1.3** identification of activities and durations for review and approval of Shop Drawings and other action submittals, fabrication and review of mock-up Work, product review and procurement, fabrication, shop inspection, and delivery, including, but not limited to, lead time, coordination drawing delivery, Substantial Completion, Punch List, Punch List Correction, Project close-out requirements, occupancy requirements, and Contract Completion;

**6.5.1.4** identification of disruptions and shutdowns due to other operations;

**6.5.1.5** identification of the critical path of the Work;

**6.5.1.6** identification of the crew size and total resource hours for each activity in the schedule; and

**6.5.1.7** the Contractor's signature and date indicating approval.

**6.5.2** The Contractor shall develop the Construction Progress Schedule using commercially available, personal computer software acceptable to the Contracting Authority and shall submit all baseline and updated schedules to the A/E in the schedules' native electronic format.

**6.5.3** The Construction Progress Schedule shall not exceed the time limits current under the Contract Documents, shall provide for reasonable, efficient, and economical execution of the Project, and shall relate to the entire Project to the extent required by the Contract Documents.

**6.5.4** The Contractor shall use the Construction Progress Schedule to plan, organize, and execute the Project, record and report actual performance and progress, and show how it plans to coordinate and complete all remaining Work within applicable Milestones. The Project participants shall use the Construction Progress Schedule as a tool for scheduling and reporting sequenced progress of the Work. The Contractor shall provide a clear graphics legend and other data including, but not limited to, Milestone dates, constraints, and other items required by the Project, A/E, Contracting Authority, and Owner. Each submission shall show the Contracting Authority's Project number and Project name, and provide a signature approval and date line for the Contractor.

**6.5.5** The Contractor shall provide in each schedule: Activity identification and description for each activity broken down to a maximum duration that is appropriate for the activity, responsibility of the Contractor, Contractor's resources and crew size for each activity, provide early start, early finish, late start, late finish dates. Each schedule shall show predecessor activities and successor activities for each activity, entry free float, total float, and percentage of completion, and identify the appropriate predecessors and successors for all related activities.

**6.5.6** The Construction Progress Schedule shall show all submittal dates, review and approval durations for coordination drawings, Shop Drawings, other action submittals, and mock-up Work.

**6.5.7** Within 30 days of the date of the Notice to Proceed, the Contractor shall submit to the A/E a proposed Construction Progress Schedule approved by the Contractor. If the Project is \$4 million total construction cost or more, the Contractor



may submit an intermediate Bar Chart Schedule for the first 120 days to the A/E within 30 days of the date of the Notice to Proceed; followed by the complete resource-loaded precedence or arrow diagram schedule within 90 days of the date of the Notice to Proceed.

**6.5.7.1** The Contractor shall submit the initial and all updates of the Construction Progress Schedule in graphic and tabular form to the A/E. With each monthly schedule update, the Contractor shall include a list of all changes to the previously approved baseline schedule or monthly updated schedule.

**6.5.7.2** After receiving the Construction Progress Schedule, the A/E shall review and submit a copy of the Construction Progress Schedule to the Contracting Authority and Owner for review and acceptance, or reject and return it to the Contractor with recommendations for revisions.

**6.5.7.3** If the Project is administered using the State's web-based project management software, the Contractor shall create, approve, and submit the initial and all updates of the Construction Progress Schedule to the A/E, Contracting Authority, and Owner through the "Schedule Approvals" business process.

**6.5.8** The Construction Progress Schedule shall be managed using early start dates and early finish dates. The Contractor must exhaust existing float before claiming additional time for a Change Order, or show that it is not possible to use float to cover the time requirements of the Change Order.

**6.5.9** The Contractor's failure to timely submit and properly maintain an approved Construction Progress Schedule may result in withholding payment in accordance with **Section 9.8**.

**6.5.10** For each progress meeting, the Contractor shall provide a 2- to 6-week look-ahead schedule, as appropriate for the Project.

**6.5.11** On a weekly basis, the Contractor shall prepare and submit to the A/E a written report describing:

**6.5.11.1** activities begun or finished during the preceding week;

**6.5.11.2** activities in progress and expected completion;

**6.5.11.3** activities to be started or finished in the upcoming 2 weeks, including but not limited to, the Contractor's workforce size and total resource hours associated with those activities; and

**6.5.11.4** other information requested by the A/E.

**6.5.12** The A/E shall attach the above information to the minutes of the weekly progress meetings.

**6.5.13** The Contractor shall provide monthly Progress Status Reports to the Contracting Authority, A/E, and Owner, which shall include recommendations for adjusting the Construction Progress Schedule to meet Milestone dates and the Substantial Completion date.

**6.5.13.1** If it is apparent to the A/E that the Contractor may be unable to meet critical path activities, Milestone completion dates, or the Substantial Completion date, the A/E shall direct the Contractor to submit within 3 days a recovery plan to avoid or minimize delay to the Project.

**6.5.13.2** A recovery plan shall include, but is not limited to, adjustments to one or more of the following:

- .1 workforce
- .2 hours per shift
- .3 shifts per workday
- .4 workdays per week
- .5 equipment
- .6 activity logic

**6.5.13.3** If the A/E approves the recovery plan, the Contractor shall prepare a revised Construction Progress Schedule approved in accordance with **Section 6.5.7**. If the A/E does not approve the recovery plan, the Contractor shall submit within 3 days an alternate recovery plan to the A/E in writing for review and approval in accordance with **Section 6.5.7**.

**6.5.14** The Contractor shall update the Construction Progress Schedule on a monthly basis, or other interval approved by the Contracting Authority, in accordance with **Section 6.5.7**.

**6.5.14.1** The updated Construction Progress Schedule approved by the Contractor shall serve as an affirmation that the Contractor can meet the requirements of the updated Construction Progress Schedule.

**6.5.14.2** The Contractor shall submit a tabular copy showing all changes to the previously approved schedule including, but not limited to, logic, float, and actual start date of activities. The original or initially approved

Construction Progress Schedule and all subsequent Construction Progress Schedules submitted by the Contractor, and accepted by the A/E, shall serve as an affirmation that the Contractor agrees to and can meet the applicable requirements of the updated Construction Progress Schedule.

**6.5.15** The Contractor's failure to timely submit an approved, updated Construction Progress Schedule may result in withholding payment in accordance with **Section 9.8**.

## 6.6 Progress Meetings

**6.6.1** The A/E shall schedule a weekly progress meeting for the Contractor and other Persons involved in the Project. The purpose of the progress meeting is to review progress on the Project during the previous week, discuss anticipated progress during the following weeks, review critical operations, and discuss critical problems.

**6.6.2** The Contractor shall be represented at every progress meeting by a Person authorized with signature authority to make decisions regarding possible modification of the Contract Documents or Construction Progress Schedule.

**6.6.2.1** The A/E shall notify the Contractor and other Persons involved in the Project of the time and place of the progress meeting that shall thereafter be the same day and hour of the week for the duration of the Project, unless the A/E notifies the Contractor and other Persons involved in the Project of a different day and hour at least 2 days in advance.

**6.6.2.2** The Contractor shall have any of its Subcontractors attend the progress meeting as determined advisable by the Contractor, or as requested by the A/E.

**6.6.3** The A/E shall prepare a written report of each progress meeting and distribute the report to the Contracting Authority, Owner, and Contractor. The A/E shall not delegate the duty to prepare a written report of any progress meeting.

**6.6.3.1** If any Person in attendance objects to anything in a report of a progress meeting, the Person shall notify the A/E, Contracting Authority, and any other affected Person in writing explaining the objection within 5 days.

**6.6.3.2** The report of each progress meeting shall reflect any objection made to the report of the previous progress meeting and any response.

**6.6.3.3** If the Project is administered using the State's web-based project management software, the Contractor shall receive written reports of progress meetings from the A/E through the "Meeting Minutes" business process, and issues identified during progress meetings that require resolution by one or more Project participants shall be documented through the "Action Items" business process.

## 6.7 Project Coordination

**6.7.1** The Contractor shall prepare drawings ("Coordination Drawings") after the Contractor and appropriate Subcontractors ("Coordination Participants") **(1)** determine the sequence of the Project, **(2)** identify the areas requiring special attention ("Coordination Areas"), and **(3)** determine the need for a coordination drawing for any Coordination Area. The Contractor shall prepare the Coordination Drawings with Computer-Aided Design ("CAD") or Building Information Modeling ("BIM") software acceptable to the Contracting Authority. The Coordination Drawings shall show the sheet metal work with plan and elevation dimensions, which specifically locate all HVAC ductwork, HVAC equipment, and HVAC piping for each Coordination Area based upon the information, discussion, and resulting consensus of the Coordination Participants during the coordination meetings.

**6.7.1.1** After the Contractor completes the Coordination Drawings, the Contractor shall forward a copy of the Coordination Drawings to the A/E, Contracting Authority, and Owner.

**6.7.1.2** The A/E shall review the Coordination Drawings to determine whether the Coordination Participants achieved the goals listed in **Section 6.7.1**. The A/E shall report any concerns, in writing, to the Coordination Participants within 14 days after receiving the drawings.

**6.7.1.3** If the Project is administered using the State's web-based project management software, the Contractor shall submit the Coordination Drawings to the A/E, and CxA if applicable, through the "Submittals" business process.

## 6.8 Additional Tests and Inspections

**6.8.1** If the A/E or the Contracting Authority determines that any portion of the Work requires special inspection, testing, or approval not otherwise required under the Contract Documents, the A/E shall order such inspection, testing, or approval.

**6.8.1.1** If the special inspection, testing, or approval reveals Defective Work, the Contractor shall pay all associated costs and will not be entitled to any related adjustment of the Contract Times. Those costs may include, but are not limited to:

- .1 the cost of the special inspection, testing, or approval;
- .2 the cost of additional special inspections, testing, or approvals to evaluate remedial Work;
- .3 the cost of correcting the Defective Work; and
- .4 all related Owner-incurred fees and charges of contractors, engineers, architects, attorneys, and other professionals.

**6.8.1.2** The Contracting Authority may deduct the costs described under **Section 6.8.1.1** from payments then or thereafter due the Contractor. If payments then or thereafter due the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to the Owner.

**6.8.1.3** If the special inspection, testing, or approval reveals that the Work complies with the Contract Documents, and the Contractor believes that it is entitled to an adjustment of the Contract Sum or Contract Times, or both, on account of the special inspection, testing, or approval, the Contractor may request a Change Order by giving written notice under **Section 7.3.2** within 7 days after the special inspection, testing, or approval.

**6.8.2** If the Contractor is aware of a need for inspection, testing, or approval, or of a need to have any inspection, testing, or approval completed by a particular time to avoid delay, then the Contractor shall timely communicate such information to the A/E and Contracting Authority.

**6.8.3** Except as described under **Section 6.8.1**, the Owner shall pay for any inspection, testing, or approval that did not become a requirement until after it awarded the Contract.

**6.8.4** The Contractor shall coordinate with and give the A/E, Contracting Authority, and Owner reasonable notice of the anticipated dates of all inspections, testing, or approvals.

**6.8.5** Within 5 days after completion of an inspection, testing, or approval, the A/E shall provide an original report/certificate of the inspection, testing, or approval to the Contractor and Contracting Authority with a recommendation for or against acceptance of the results therein.

## **6.9 Review of Contract Documents and Field Conditions**

**6.9.1** Before starting each portion of the Work, the Contractor shall carefully study and compare the various Contract Documents relative to that portion of the Work, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the Site affecting it.

**6.9.2** If the Contractor finds any perceived ambiguity, conflict, error, omission, or discrepancy on or between any of the Contract Documents, or between any of the Contract Documents and any Applicable Law, the Contractor, before proceeding with the Work, shall promptly submit a Request for Interpretation (“RFI”) to the A/E for an interpretation or clarification.

**6.9.2.1** Before submitting any RFI to the A/E, the Contractor shall carefully review the Contract Documents to ensure that the Contract Documents do not answer the RFI.

**6.9.2.2** The A/E shall respond to an RFI within 3 days of receiving the RFI.

**6.9.2.3** Any interpretation or clarification of the Contract Documents made by any Person other than the A/E, or in any manner other than writing, shall not be binding and the Contractor shall not rely upon it.

**6.9.2.4** If the Project is administered using the State’s web-based project management software, the Contractor shall submit RFIs to the A/E through the “Requests for Interpretation” business process.

**6.9.3** If the Contractor believes that it is entitled to an adjustment of the Contract Sum or Contract Times, or both, on account of clarifications or instructions issued by the A/E in response to a RFI, the Contractor may request a Change Order by giving written notice under **Section 7.3.2** within 7 days of receiving the A/E’s RFI response.

**6.9.4** If the Contractor does not notify the A/E per **Section 6.9.3**, the Contractor will have accepted the RFI response without an adjustment to the Contract Sum or Contract Times.

## **6.10 Protection of the Project**

**6.10.1** The Contractor shall protect the Work from weather and maintain the Work and all materials, apparatus, and fixtures free from injury or damage until Substantial Completion of the Work.

**6.10.1.1** The Contractor shall at all times cover or protect the Work.

**6.10.1.2** The Contractor, at its expense, shall remove, and replace with new, any Work damaged as a result of the Contractor's failure to provide coverage or protection.

**6.10.1.3** The Contractor, at its expense, shall repair or replace any adjacent property, including, but not limited to, roads, walks, shrubbery, plants, trees, or turf, damaged during performance of the Work.

**6.10.1.4** After the date of Substantial Completion of the Work, the Owner is responsible for protecting and maintaining all materials, apparatus, and fixtures for the occupied portion of the Project free from injury or damage.

**6.10.2** The Contractor shall protect the Project and existing or adjacent property from damage at all times and shall erect and maintain necessary barriers, furnish and keep lighted necessary danger signals at night, and take reasonable precautions to prevent injury or damage to individuals or property.

**6.10.3** The Contractor shall not load, or permit any part of the Project to be loaded, in any manner that endangers the Project, or any portion thereof. The Contractor shall not subject any part of the Project or existing or adjacent property to stress or pressure that endangers the Project or property.

**6.10.4** The Contractor shall provide all temporary bracing, shoring, and other structural support required for safety of the Project and proper execution of the Work.

**6.10.5** Vibration, Noise, and Dust Control.

**6.10.5.1** The Contractor shall provide controls/barriers for vibrations, noise, and dust control in occupied buildings as required by the construction operations.

**6.10.5.2** The Contractor will not be permitted to exhaust or release unfiltered air, dust, construction debris, or other undesirable products into the exterior atmosphere or into occupied areas of the building outside the Site. The Project Manager may limit or stop the Work if the Contractor does not maintain proper air-quality standards.

**6.10.5.3** In certain occupied buildings, tasks might be of such a nature that noise and vibration cannot be tolerated. In such spaces, Work shall be scheduled for other than normal working hours. The Contractor is cautioned that weekend or overtime work, if required, shall be performed at no additional cost. Permission to work other than standard hours shall be received from the Contracting Authority prior to the occurrence. Weekend and overtime Work shall be reflected in the Construction Progress Schedule.

**6.10.5.4** The Contractor is responsible for vibration control and control of transmission of noise arising from the Work. Principal considerations that shall be given to noise and vibration control are:

- .1 Noise control in compliance with Occupational Safety and Health Administration ("OSHA") requirements for the health and safety of building occupants; control shall be for all areas of the facility, including equipment rooms, boiler rooms, and fan rooms.
- .2 Vibration control to limit sound produced by construction equipment, and for protection of the equipment existing in a building and the building structure.
- .3 Vibration control to provide for maximum usefulness of the facility by keeping levels of vibration within ranges conducive to study and work or other uses for which the facility is designed.

## **6.11 Materials and Equipment**

**6.11.1** The Contractor shall provide new materials and equipment of the quality specified in the Contract Documents.

**6.11.2** The Contractor shall bring to or store at the Site only the materials and equipment required in the Work. If possible, materials and equipment should be installed in their final positions when brought to the Site.

**6.11.2.1** The Contractor shall properly store and protect all materials and equipment it provides to the Project.

**6.11.2.2** The Contractor shall timely remove from the Site any materials or equipment no longer required for the Work.

**6.11.3** The Contractor shall not allow materials or equipment to damage the Project or adjacent property, nor to endanger any individual at or near the Site.

**6.11.4** If the Contractor provides an Acceptable Component, the Contractor shall be solely responsible for the costs of coordination and modification required.

**6.11.5** If the Contractor provides approved Substitutions that require changes to the Contract Documents, the Contractor shall be solely responsible for the additional costs incurred as a result, including, but not limited to, changes to the design by the A/E.

**6.11.6** The A/E shall consider Requests for Substitutions after the bid opening only when the Contractor can conclusively demonstrate to the A/E the following conditions:

**6.11.6.1** the specified Basis of Design Components, Acceptable Components, or previously-approved Substitutions, through no fault of the Contractor or a Subcontractor, are not available; or

**6.11.6.2** the specified Basis of Design Components, Acceptable Components, or previously-approved Substitutions will not perform as designed or intended.

**6.11.7** The Contractor's incorporation of unapproved Substitutions in the Work shall constitute Defective Work.

## **6.12 Labor**

**6.12.1** The Contractor shall maintain a sufficient workforce and enforce good discipline and order among its employees and the employees of its Subcontractors. The Contractor shall not permit employment of individuals not skilled in tasks assigned to them.

**6.12.2** The Contractor shall dismiss from the Project any individual employed by the Contractor, or a Subcontractor, who the Contracting Authority finds, in its sole discretion, to be incompetent, guilty of misconduct, or detrimental to the Project.

**6.12.3** The Contractor shall employ all legal efforts to minimize the likelihood or effect of any strike, Work stoppage, or other labor disturbance. Informational pickets shall not justify any Work stoppage.

## **6.13 Safety Precautions**

**6.13.1** The Contractor shall take reasonable precautions to ensure the safety of individuals on the Project.

**6.13.1.1** The Contractor is responsible for designing and implementing its own safety program, including compliance with OSHA regulations. The Contractor's safety plans, such as fall protection, hazards, communications, competent person, etc., shall meet or exceed the Owner's safety plan (if any).

**6.13.2** The Contractor shall pay any fine or cost incurred because of the Contractor's violation, or alleged violation, of Applicable Law.

**6.13.3** Before starting any Work, the Contractor shall submit to the Contracting Authority a copy of the Contractor's site-specific safety plan and safety manuals.

**6.13.4** The Contractor shall not introduce Hazardous Materials to the Project or burn any fires on the Site.

**6.13.4.1** The Contractor shall notify the Project Manager 24 hours before the start of non-routine or non-recurring hot-work. Use of sources of fire, flame or sparks and flammable materials shall be kept to an absolute minimum. At the beginning of the Project, the Contractor shall inform the Project Manager of its intent to use blowtorches, welding apparatus or similar exposed flame and sparking devices. Similar notice shall be given in regard to the use of flammable liquids, adhesives, and cleaners.

**6.13.4.2** The Contractor shall furnish an appropriate number of fire extinguishers (minimum of 1), which shall be within the immediate areas where work is being done at all times. The extinguisher shall be adequate and suitable for the class of fire likely to be caused by the Contractor's operations.

**6.13.5** Work Stoppage Due to Hazardous Materials.

**6.13.5.1** If the Contractor encounters material the Contractor reasonably believes to be, or contain, a Hazardous Material that has not been rendered harmless, the Contractor shall immediately stop Work in the affected area and verbally report the condition to the Contracting Authority and A/E, and within 1 business day deliver written notice of the condition to the Contracting Authority and A/E.

**6.13.5.2** The Contracting Authority will promptly determine the necessity of the Owner retaining a qualified environmental consultant to evaluate the suspected Hazardous Material and to issue a related written report. Where appropriate, the Owner will engage a licensed abatement contractor to remove the material or render it harmless as directed.

**6.13.5.3** The Contractor shall resume Work in the affected area upon written notice from the A/E that **(1)** the suspect material was evaluated and found not to be or contain a Hazardous Material, or **(2)** the suspect material has been removed or rendered harmless.

**6.13.5.4** If the Contractor knowingly or negligently proceeds with the Work in an area where a Hazardous Material exists and has not been rendered harmless, the Contractor shall be solely responsible for all related claims, damages,

losses, and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from performing the Work in the affected area.

**6.13.5.5** The term "rendered harmless" means that the level of exposure is less than any applicable exposure standards set forth in Applicable Law.

**6.13.6** Safety Data Sheets.

**6.13.6.1** The Contractor shall identify any material it uses at the Site with a Safety Data Sheet ("SDS") meeting the requirements of OSHA's Hazard Communication Standard (formerly known as a Material Safety Data Sheet).

**6.13.6.2** The Contractor shall maintain a notebook containing all of its applicable SDSs. This notebook shall be kept at the Site for the duration of the Project.

**6.14 Construction Facilities, Utilities, and Equipment**

**6.14.1** Facilities.

**6.14.1.1** The Contractor shall provide and maintain in a clean condition suitable temporary facilities, equipment, services, and enclosed storage for its use at the Site.

**6.14.1.2** The Contractor shall provide and maintain in a clean condition:

- .1 suitable facilities, equipment, and services for use by the A/E and Contracting Authority;
- .2 adequate space, equipment, and furnishings to conduct progress meetings, and store approved documents and permits; and
- .3 adequate sanitary facilities for use by all Persons at the Site.

**6.14.2** Environmental Controls.

**6.14.2.1** The Contractor shall protect its Work and materials from weather and damage from heat, cold, and humidity.

**6.14.2.2** Until the permanent HVAC system is complete and available for use:

- .1 the Contractor shall make arrangements and pay for installation and maintenance of temporary heating and ventilating systems; and
- .2 the Contractor shall pay the costs incurred in operating the temporary heating and ventilating systems.

**6.14.2.3** When the permanent HVAC system is complete and available for use:

- .1 The Contractor shall start up and maintain operation of the permanent HVAC system, including filters, and promptly remove temporary heating and ventilating systems.
- .2 If the Project consists entirely of new construction, the Contractor shall pay the costs of energy consumed in operating the permanent HVAC system until Substantial Completion.
- .3 If the Project is a renovation of an existing building or structure, addition(s) to an existing building or structure, or any combination of new construction and renovation work that does not allow separate metering of utilities, the Owner shall pay the costs of energy consumed in operating the permanent HVAC system.

**6.14.2.4** From the date of Substantial Completion, the Owner shall pay the cost of operating the permanent HVAC system for the occupied portion of the Project.

**6.14.2.5** If the permanent HVAC system is used during construction, the Contractor shall furnish an extended warranty and service contract in effect until the expiration of the Correction Period.

**6.14.3** Water and Drainage.

**6.14.3.1** The Contractor shall provide water necessary for the Work until the permanent plumbing system is available for use.

**6.14.3.2** The Contractor shall provide temporary drainage and dewatering necessary for the Work and shall employ pumps, trenches, drains, sumps, and other necessary elements required to provide satisfactory working conditions for the protection, execution, and completion of the Project.

**6.14.3.3** The Contractor shall make arrangements and pay for installation and maintenance of temporary plumbing systems until the permanent plumbing system is available for use.

**6.14.3.4** When the permanent plumbing system is complete and available for use:

- .1 The Contractor shall start up and maintain operation of the permanent plumbing systems, and make arrangements and pay for removal of temporary plumbing systems.

- .2** If the Project consists entirely of new construction, the Contractor shall pay the costs of water consumed and sewerage charges until Substantial Completion.
- .3** If the Project is a renovation of an existing building or structure, addition(s) to an existing building or structure, or any combination of new construction and renovation work that does not allow separate metering of utilities, the Owner shall pay the costs of water consumed and sewerage charges.

**6.14.3.5** From the date of Substantial Completion, the Owner shall pay the costs of water consumed and sewerage charges for the occupied portion of the Project.

**6.14.3.6** If the permanent plumbing system is used during construction, the Contractor shall furnish an extended warranty and service contract in effect until the expiration of the Correction Period.

**6.14.4** Electric Service.

**6.14.4.1** The Contractor shall provide temporary light and power; pay the charges for temporary electric service installation, and removal if required.

**6.14.4.2** If the Project consists entirely of new construction, the Contractor shall pay the cost of energy consumed until Substantial Completion.

**6.14.4.3** If the Project is a renovation of an existing building or structure, addition(s) to an existing building or structure, or any combination of new construction and renovation work that does not allow separate metering of utilities, the Owner shall pay the cost of energy consumed.

**6.14.4.4** From the date of Substantial Completion, the Owner shall pay the cost of energy consumed for the occupied portions of the Project.

**6.14.4.5** If the permanent electrical system is used during construction, the Contractor shall furnish an extended warranty and service contract in effect until the expiration of the Correction Period.

**6.14.5** Hoisting Facilities.

**6.14.5.1** The Contractor shall erect and maintain any hoisting equipment required for its Work.

**6.14.5.2** If the electric service requirements of hoisting facilities differ from that available at the Site, the Contractor shall provide and pay for all necessary connections.

**6.14.5.3** If a permanent elevator is identified in the Contract Documents to be used for hoisting materials or personnel during construction, the Contractor shall furnish an extended warranty and service contract in effect until the expiration of the Correction Period.

**6.15** Progress Cleaning

**6.15.1** The Contractor shall remove all waste materials, rubbish, and mud attributable to the Work to an appropriate disposal location at, or near, the Site.

**6.15.2** The Contractor shall perform weekly broom cleaning of hard flooring surfaces in the area of the Work.

**6.15.3** The Contractor shall remove, once each working day or as appropriate for the Project, all waste materials and rubbish from the disposal location at, or near, the Site.

**6.15.4** The Contractor shall remove, as appropriate for the Project or as the A/E or Owner directs, any waste materials or rubbish from areas adjacent to the Project.

**6.15.4.1** The Contractor shall dispose of waste materials, rubbish, and construction debris in a lawful manner in approved recycling facilities or landfills.

**6.15.5** If the Contractor fails to clean up during the progress of the Work, the Contracting Authority may clean up on behalf of the Contractor and at the Contractor's expense. If the Contractor fails to maintain the areas adjacent to the Project clean and free of waste materials and rubbish, the Contracting Authority may also direct the local jurisdiction responsible for the area to have the area cleaned to its satisfaction at the Contractor's expense.

**6.15.5.1** The Contracting Authority may deduct the cleaning costs from payments then or thereafter due the Contractor. If payments then or thereafter due the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to the Owner.

**6.15.6** The Contractor shall remove excavated material and spoil to a suitable off-site location approved by the Contracting Authority.

**6.15.6.1** If the Owner designates a location on its property for disposal or storage of clean topsoil and/or subsoil in the Contract Documents, the Contractor shall remove such materials to the designated location.

## 6.16 Use of Premises

**6.16.1** The Contractor shall use corridors, stairs, and elevators as designated by the Contracting Authority. The Contractor shall exercise extreme care to not exceed the carrying capacity of elevators or damage the cab interior in any way.

**6.16.2** Loitering or wandering through interior of buildings or exterior grounds outside the limits of the Work will not be permitted.

**6.16.3** The Contractor shall confine its apparatus, materials, and the operations of its workers to the limits indicated by law, ordinances, permits and the directions of the A/E or Project Manager.

**6.16.4** No signs or advertising of any kind will be permitted on or about the Site, except those appearing on trucks and trailers.

### **6.16.5** Site Logistics Plan.

**6.16.5.1** The Contractor shall prepare a plan of the Site indicating how the Contractor intends to use the Site. The plan should illustrate, as an example, areas to be used for lay down of material and equipment; office and storage trailer locations; vehicular access gates with ingress and egress routes; locations of wheel wash and concrete truck wash out activities; and offloading and hoisting locations.

### **6.16.6** Smoking and Tobacco Products.

**6.16.6.1** All State buildings are smoke free. Smoking will not be permitted in any indoor area. The ban on tobacco products will be observed in all indoor and outdoor areas and parking areas on all State-owned and leased property. The Contractor shall enforce these restrictions on any individual employed by the Contractor, or a Subcontractor.

## 6.17 Interruption of Existing Services

**6.17.1** Whenever it becomes necessary to interrupt existing services in use by the Owner or its tenants, including but not limited to sewer, water, gas, and steam lines, electric, telephone, and cable service, the Contractor shall continue the associated Work on a non-stop 24-hour per day basis until that Work is completed and the service restored, or at an alternate time required by the Contracting Authority.

**6.17.2** Before beginning that Work, the Contractor shall apply in writing to, and receive approval in writing from, the Owner, through the A/E, to establish a time when interruption of the service will cause a minimum of interference with the activities of the Owner and its tenants.

## 6.18 Explosives and Blasting

**6.18.1** The Contractor shall not conduct blasting on, or bring explosives to, the Site without the prior written approval of the Contracting Authority, Owner, and other authorities with jurisdiction.

**6.18.2** The Contractor shall perform all blasting, storing, and handling of explosives as required under Applicable Law.

**6.18.2.1** The Contractor shall carry appropriate liability insurance coverage, as required by the Contract Documents, for its blasting and explosives storage and handling operations. Immediately upon request, the Contractor shall deliver evidence of that insurance to the Contracting Authority.

## 6.19 Building Commissioning

**6.19.1** If the Project scope includes building commissioning, the Contractor shall participate in the Commissioning Process, as prescribed in the Contract Documents.

**6.19.2** The Contractor shall permit the A/E, or a third-party Commissioning Agent (“CxA”) if applicable, access to commission performance based equipment, fixtures, and/or systems (e.g., HVAC, fire protection, smoke evacuation, fume hoods, emergency power, etc.), prior to Substantial Completion.

**6.19.3** The A/E, or CxA if applicable, shall promptly notify, in writing, the Contractor of any deficiency identified during the Commissioning Process.

**6.19.4** To facilitate the Commissioning Process, the Contractor shall submit 4 sets of Operation and Maintenance Manuals for dynamic and engineered systems to the A/E, and CxA if applicable, for approval. This submission shall occur within 30 days following approval of all related Contractor submittals required by the Contract Documents.



## 6.20 Action Submittals

**6.20.1 Submittal Description.** Shop Drawings, Product Data, Samples, and other submittals for the A/E's review and action shall be provided by the Contractor for any item required by the Contract Documents but not fully described in the Contract Documents, unless waived by the A/E, and include, but are not limited to:

- 6.20.1.1** construction of the various parts, method of joinery, type of materials, grade, quality and thickness of materials, alloy of materials, profiles of all sections, reinforcement, method of hanging doors or installing windows, anchorage, and type and grade of finish;
- 6.20.1.2** capacities, types of materials and performance charts that are pertinent to the materials, and performance charts that are pertinent to the equipment item; and
- 6.20.1.3** wiring diagrams, control diagrams, schematic diagrams, working and erection dimensions, arrangement and specifications.

**6.20.2 Form of Submittals.** The Contractor shall provide a transmittal letter, review and stamp its approval, and transmit the submittals to the A/E in accordance with the submittal schedule established by the A/E and Contractor.

**6.20.2.1** The Contractor shall submit a minimum of 1 reproducible and 3 copies of Shop Drawings, and a minimum of 4 copies of any other submittal, except when using the State's web-based project management software under **Section 6.20.2.4**.

**6.20.2.2** The data shown on the Shop Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to communicate to the A/E the materials and equipment that the Contractor proposes to provide.

**6.20.2.3** Each Sample shall be identified clearly as to materials, supplier, pertinent data as catalog numbers, the intended use, and other uses as the A/E may require enabling the A/E to review the submittal.

**6.20.2.4** If the Project is administered using the State's web-based project management software, the Contractor shall submit electronic files of its submittals for review, using the "Submittals" business process.

**6.20.3 Variation from Contract Documents.** If the submittals show variations from the requirements of the Contract Documents, the Contractor shall specifically and clearly identify the variations in its letter of transmittal.

**6.20.3.1** Variations that may affect the construction quality, cost or timeline shall be submitted by the A/E to the Contracting Authority for review, and if approved, shall be incorporated into the Work by Change Order.

**6.20.3.2** The Contractor shall not be relieved of responsibility for deviations from the Contract Documents by the A/E's approval of submittals.

**6.20.3.3** Submittals are not Contract Documents. In the event of conflicts between submittals and the Contract Documents, the Contract Documents take precedence and govern the Work.

**6.20.4 Contractor's Submittal Review.** The Contractor shall review and stamp "approved" all submittals before forwarding them to the A/E. If it is apparent to the A/E that the Contractor has not reviewed the submittals, or has conducted an incomplete review, the A/E may reject the submittals.

**6.20.4.1** The Contractor shall field verify conditions as necessary and make corrections of dimensions, locations of various items, encroachments of work of Separate Contractors, or variations from the requirements of the Contract Documents.

**6.20.4.2** If required by the Contract Documents or Applicable Law, the Contractor shall have Shop Drawings or other submittals prepared by Persons possessing expertise and experience in an appropriate trade or profession or by a registered architect, professional engineer, or other professional.

**6.20.4.3** By approving and submitting submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements, and field construction criteria related to the associated Work, or shall do so, and has checked and coordinated the information contained within the submittals with the requirements of the Work and of the Contract Documents.

**6.20.5 A/E's Submittal Review.** The A/E shall review submittals for conformity with design intent within 14 days of receiving them or in accordance with the approved submittal schedule, or other period as mutually agreed by the A/E and Contractor. The A/E's review of submittals is to determine if the items covered by the submittals will, after installation and incorporation into the Work, conform to the Contract Documents and be compatible with the design concept of the Project as a functioning whole.

**6.20.5.1** The Contractor shall make corrections required by the A/E and resubmit the required number of corrected copies of submittals until approved, which resubmission shall be acted upon by the A/E within 14 days of receiving them, or other period mutually agreed by the A/E and Contractor.

**6.20.5.2** When resubmitting corrected submittals, the Contractor shall direct the A/E's attention to revisions made by noting revisions on the resubmittal.

**6.20.5.3** The Contractor shall pay all reasonable costs of the A/E, Owner, and Contracting Authority for attendant delay, interference, hindrance or disruption of the Project due to excessive resubmittals without fault of the A/E, the Owner, or Contracting Authority. Resubmittals in excess of 2 without fault of the A/E, Owner, or Contracting Authority may be determined excessive by the Contracting Authority.

**6.20.5.4** The A/E may hold Samples and other submittals used to coordinate finishes, colors, patterns, textures, or other characteristics until submittals for adjacent materials are available. The A/E shall issue a written notice to the Contractor stating that the submittal is being held, within 7 days of receiving it.

**6.20.5.5** If coordinating submittals are not received within the period required for action on previously received submittals that are held in accordance with **Section 6.20.5.4**, review of the previously received submittals may be delayed.

**6.20.5.6** The A/E's review shall not extend to means, methods, manners, techniques, sequences, or procedures of construction, or to safety precautions or incident programs.

**6.20.5.7** The review and approval of a separate item shall not indicate approval of the assembly in which the item functions.

**6.20.6** Risk of Nonpayment. The Contractor shall not commence any portion of the Work requiring Shop Drawings, Product Data, Samples, or other submittals until the submittal has been approved by the A/E. If the Contractor starts Work before the A/E's final approval of the submittal, the Contractor does so at its own risk that payment may not be approved by the Contracting Authority or made by the Owner for the related Work.

**6.20.7** Equipment Statement. Shop Drawings on equipment shall include the following written statement from the manufacturer of the equipment:

**6.20.7.1** "This equipment submitted for approval shall perform as specified when installed in the arrangement shown on this drawing and in the Contract Documents and in conjunction with all other accessories as flues, breechings, piping, controls, and equipment not furnished by this manufacturer, but required as an accessory or supplement to this equipment, providing that the accessory or supplementary items perform as specified and are installed as shown in the Contract Documents."

.1 The Contractor will be deemed to have included the above statement as required even if the associated Shop Drawing does not actually contain the statement.

**6.20.7.2** This equipment statement shall not be required for Samples, Product Data, and other standard submittals that are not created specifically for this Project.

**6.20.8** Domestic Steel Certifications. The Contractor shall include the following written certifications on the front cover or initial sheet of each structural steel fabrication Shop Drawing, signed and dated prior to fabrication:

**6.20.8.1** "Steel Fabricator Certification: The steel fabricator identified below certifies that for this project all load-bearing structural steel has been fabricated or produced, to the best of its knowledge, only from steel made in the United States in accordance with Ohio Revised Code Section 153.011. Further, the steel fabricator hereby certifies that it has read and understands that a monetary penalty for violations may be imposed under the authority of Ohio Revised Code Section 153.99." This certification shall be followed by the name of the fabrication company, name of the company official signing the certification, the signature of that company official, and the date of that signature.

.1 The Contractor will be deemed to have included the above certification as required even if the associated Shop Drawing does not actually contain the certification.

**6.20.8.2** "Contractor Certification: The contractor identified below certifies that it has required as a condition of purchase, that for this project all load-bearing structural steel shall be fabricated and produced using, to the best of its knowledge, only steel made in the United States in accordance with Ohio Revised Code Section 153.011. Further, the contractor hereby certifies that it has read and understands that a monetary penalty for violations may be imposed under the authority of Ohio Revised Code Section 153.99." This certification shall be followed by the name of the Contractor company, name of the company official signing the certification, the signature of that company official, and the date of that signature.

.1 The Contractor will be deemed to have included the above certification as required even if the associated Shop Drawing does not actually contain the certification.

## 6.21 Warranty

**6.21.1** The Contractor warrants to the Contracting Authority and Owner that all materials and equipment furnished under the Contract shall be new and of good quality unless otherwise required or permitted by the Contract Documents, that the Work shall be free from defects not inherent in the quality required or permitted, and that the Work shall conform to the requirements of the Contract Documents. Work not conforming to those requirements, including Substitutions not properly approved and authorized, may be considered Defective Work. If required by the A/E, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

**6.21.1.1** If the Contractor or a Subcontractor recommends a particular product, material, system, or item of equipment for incorporation into the Project and the Owner accepts that recommendation, the above warranty includes a warranty from the Contractor to the Owner that the recommended product, material, system, or item of equipment is fit and appropriate for the associated purpose.

## 6.22 Uncovering the Work

**6.22.1** If the Contractor covers Work contrary to the requirements of the Contract Documents or contrary to the written request of the Contracting Authority or A/E, the Contractor shall, if the Contracting Authority or A/E requests in writing, uncover that Work for observation, correct it if not in conformity with the Contract Documents, and recover it at the Contractor's expense without adjustment of the Contract Times.

**6.22.2** If the Contractor covers Work in accordance with the Contract Documents and not contrary to a request from the A/E or Contracting Authority for an opportunity to observe the Work prior to covering, the Contractor shall, if the A/E requests in writing, uncover that Work.

**6.22.2.1** If the uncovered Work is Defective Work, the Contractor shall pay the costs of uncovering, correcting, and recovering the Work and shall not be entitled to an adjustment of the Contract Times.

**6.22.2.2** If the uncovered Work is not Defective Work and the Contractor believes that it is entitled to an adjustment of the Contract Sum or Contract Times, or both, on account of the uncovering and recovering of the Work, the Contractor may request a Change Order by giving written notice under **Section 7.3.2** within 7 days after the Contracting Authority or A/E observes the uncovered Work.

## 6.23 Correction of the Work

### **6.23.1** Before Substantial Completion.

**6.23.1.1** If the Contractor provides Defective Work or fails or neglects to perform the Work in accordance with the Construction Progress Schedule, the Contracting Authority or A/E may issue a written notice to the Contractor and Contractor's Surety directing the Contractor to correct the Defective Work or recover schedule deficiencies. Unless otherwise specified in that written notice, the Contractor shall begin to correct the Defective Work and recover the schedule deficiencies within no more than three days after the Contracting Authority issues the written notice ("72-Hour Notice").

**6.23.1.2** If the Contractor fails to promptly commence and diligently pursue correction of Defective Work or recovery of schedule deficiencies required under **Section 6.23.1.1**, the Owner may correct the Defective Work or take action to recover schedule deficiencies without giving further notice to the Contractor or Contractor's Surety.

### **6.23.2** After Substantial Completion.

**6.23.2.1** In addition to the Contractor's other obligations under the Contract Documents, if any of the Work is found to be Defective Work after Substantial Completion, the Contractor shall correct it promptly after receipt of written notice from the A/E, Contracting Authority, or Owner to do so, unless the Contracting Authority and Owner have previously acknowledged and accepted the Defective Work in writing. The A/E, Contracting Authority, or Owner may send a copy of the written notice to the Contractor's Surety, but are not obligated to do so.

**6.23.2.2** During the Correction Period. If the Contracting Authority or Owner issues a notice under **Section 6.23.2.1** during the Correction Period, the Owner may correct the Defective Work itself without giving further notice to the Contractor or Contractor's Surety if the Contractor fails to (1) notify the Owner in writing of the Contractor's intent to correct the Defective Work within 7 days after the Contracting Authority or Owner issues the notice and (2) thereafter promptly commence and diligently pursue correction of Defective Work.

**6.23.2.3** The Correction Period:

- .1 commences on the date of Substantial Completion of the Work or a designated portion of the Work which the Contracting Authority and Owner have agreed to take Partial Occupancy;

- .2 relates only to the Contractor's specific obligation and opportunity to correct the Work during the Correction Period;
- .3 does not establish a period of limitation with respect to any of the Contractor's other obligations under the Contract Documents;
- .4 has no relationship to the time within which the State or Owner may seek to enforce the Contract;
- .5 does not establish a period of limitation within respect to the commencement of litigation to establish the Contractor's liability under the Contract or otherwise; and
- .6 shall not be extended by corrective Work performed by the Contractor under this **Section 6.23.2**.

**6.23.2.4** After the Correction Period. If the Owner issues notice under **Section 6.23.2.1** after expiration of the Correction Period, the Owner may correct the Defective Work without giving further notice to the Contractor or Contractor's Surety if the Contractor fails to **(1)** notify the Owner in writing of the Contractor's intent to correct the Defective Work within 14 days after the Owner issues the notice and **(2)** thereafter promptly commence and diligently pursue correction of Defective Work.

### **6.23.3** Emergency Correction of Defective Work.

**6.23.3.1** Notwithstanding any other provision of the Contract to the contrary, if in the Contracting Authority or Owner's opinion the Defective Work presents a threat of imminent harm or danger to people, property, or the environment, the Contracting Authority or Owner may order the Contractor to immediately correct Defective Work or the Owner may correct the Defective Work itself without any prior notice to the Contractor or Contractor's Surety.

### **6.23.4** Responsibility for Costs of Correction.

**6.23.4.1** The Contractor shall pay all of the costs and damages associated with the correction of Defective Work and the recovery of schedule deficiencies under this **Section 6.23**. Those costs and damages may include, but are not limited to, the related fees and charges of contractors, engineers, architects, attorneys, and other professionals; and the cost of correcting or replacing adjacent work. The Contracting Authority may deduct those costs and damages from payments then or thereafter due the Contractor. If payments then or thereafter due the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to the Owner.

## **6.24 Acceptance of Defective Work**

**6.24.1** The Owner may accept any Defective Work instead of requiring its removal or correction, in which case the Contract Sum must be equitably reduced as described under **Article 7**.

**6.24.1.1** The Owner may only accept Defective Work though a deduct Change Order that makes explicit reference to this **Section 6.24**.

**6.24.2** None of the following will constitute **(1)** acceptance of Defective Work, **(2)** a release of the Contractor's obligation to perform the Work in accordance with the Contract, or **(3)** a waiver of any rights set forth in the Contract or otherwise provided by Applicable Law:

- 6.24.2.1** observations or inspections by the Owner, Contracting Authority, or A/E;
- 6.24.2.2** the making of any payment;
- 6.24.2.3** Substantial Completion or the issuance of a Certificate of Substantial Completion;
- 6.24.2.4** Partial Occupancy and the Owner's use or occupancy of the Work or any part of it;
- 6.24.2.5** Contract Completion or the issuance of a partial or final Certificate of Contract Completion;
- 6.24.2.6** any review or approval of a submittal;
- 6.24.2.7** any inspection, test, or approval by other Persons; or
- 6.24.2.8** any correction of Defective Work by the Owner.

## **6.25 Project Document Maintenance and Submittal**

### **6.25.1** During Construction.

**6.25.1.1** The Contractor shall maintain in good order at a secure location on the Site:

- .1 a complete copy of all Contract Documents; Shop Drawings, Product Data, Samples and similar required submittals; manufacturer operating and maintenance instructions; certificates; warranties; RFIs and responses thereto; and other Project-related documents, all marked currently and accurately to record field

changes and selections made during construction and to show actual installation where installation varies from Work as originally shown, including the exact location and depth of underground utility lines; and

- .2 a set of Drawings and Specifications, approved in accordance with **Section 5.2.1.1**, and the records required by **Section 6.2.17**.

**6.25.1.2** Before submitting each Contractor Payment Request, the Contractor shall record all changes on the Contract Documents, neatly in a contrasting color, noting new information not shown on the original Contract Documents. Failure to record all changes may cause payment to be withheld or delayed by the Contracting Authority.

**6.25.1.3** The Contractor shall keep a record of changes made to the Specifications, noting particularly any approved variation from manufacturer's installation instructions and recommendations.

**6.25.1.4** If the Contractor uses Shop Drawings to indicate as-built conditions, the Contractor shall cross-reference the Shop Drawing sheet numbers to the corresponding sheet numbers on the Contract Documents. The Contractor shall note related numbers where applicable.

**6.25.1.5** The Contractor shall at all times permit access to the documents described in this **Section 6.25.1** to authorized representatives of the State, local authorities having jurisdiction, Contracting Authority, Owner, and A/E.

#### **6.25.2** Before Contract Completion.

**6.25.2.1** The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and final payment, shall organize the As-Built Documents into manageable sets, bind the sets with durable paper cover sheets, and deliver the As-Built Documents to the A/E.

**6.25.2.2** The Contractor's As-Built Documents submission shall include, but is not limited to:

- .1 Certificate of Occupancy;
- .2 inspection certificates for pressure piping, elevator, boiler, electrical, plumbing or piping purification, etc.;
- .3 Letter of Approval from the local fire authority or State Fire Marshal for the fire suppression system;
- .4 Operation and Maintenance Manuals, organized into suitable sets of manageable size. Indexed data bound in individual binders, with pocket folders for folded sheet information and appropriate identification marked on the front and the spine of each binder;
- .5 neatly and accurately marked sets of As-Built Documents, and other Contract Documents reflecting the actual construction of the Project;
- .6 detailed Drawings reflecting the exact location of any concealed utilities, mechanical or electrical systems, and components;
- .7 assignment to the Owner of all warranties and guarantees, including the most-recent address and telephone number of any Subcontractors or manufacturers;
- .8 an affidavit to certify that all Subcontractors have been paid in full for all Work performed or materials furnished for the Project;
- .9 final certified payroll reports; and
- .10 an affidavit to certify that the Contractor and each of its Subcontractors, regardless of tier, have complied with all requirements of ORC Chapter 4115.

**6.25.2.3** By submitting the As-Built Documents to the A/E, the Contractor certifies that its As-Built Documents are complete, correct, and accurate.

#### **6.25.3** Record Documents.

**6.25.3.1** The A/E shall revise the original Contract Documents and related electronic files with the information contained on the As-Built Documents. The A/E shall label the revised original Contract Documents and related electronic files as "Record Documents" and reflect the date of the A/E's incorporation of the As-Built Documents.

**6.25.3.2** The Owner may thereafter use the Record Documents for any purpose relating to the Project including, but not limited to, additions to or completion of the Project.

### **6.26 Final Cleaning**

**6.26.1** Before requesting the Substantial Completion inspection of the Work, the Contractor shall clean the Site, remove waste materials and rubbish attributable to the Project, and restore the property to its original condition so that upon Substantial Completion, the premises are ready for occupancy by the Owner.

**6.26.2** If the Contractor performs any Work after final cleaning, the Contractor shall clean the affected area as provided above so that upon Substantial Completion, the premises are ready for occupancy by the Owner.

**6.26.3** Final cleaning shall be done to the reasonable satisfaction of the A/E and Contracting Authority.

## **6.27 Substantial Completion**

### **6.27.1 Contractor's Punch List.**

**6.27.1.1** When the Contractor considers the Work, or a designated portion thereof, Substantially Complete the Contractor shall inspect the Work and prepare a list of Defective Work and incomplete or unacceptable Work ("Contractor's Punch List"). The Contractor shall list all items of Work not in compliance with the Contract Documents, including items the Contractor is requesting to be deferred.

- .1** The Contractor shall proceed to correct all items listed on the Contractor's Punch List and certify that the incomplete items listed on the Contractor's Punch List are to its knowledge an accurate and complete list by signing the Contractor's Punch List.
- .2** The Contractor's failure to include an item on the Contractor's Punch List shall not alter the Contractor's responsibility to complete the Work in accordance with the Contract Documents.
- .3** The Contractor shall submit the signed Contractor's Punch List to the A/E, together with a request for the Substantial Completion inspection of the Work.

**6.27.1.2** If the Project is administered using the State's web-based project management software, the Contractor shall submit the Contractor's Punch List, using the "Punch List" business process.

### **6.27.2 Substantial Completion Inspection.**

**6.27.2.1** Within 3 business days after receipt of the request for the Substantial Completion inspection of the Work, the A/E shall notify the Contractor of acceptance or rejection of the request, stating reasons for any rejection.

- .1** Within 7 days after its acceptance of the Contractor's request, the A/E shall conduct the Substantial Completion inspection to determine whether the Work, or designated portion, is in conformity with the Contract Documents and Substantially Complete. The A/E shall notify the Contractor, Contracting Authority, and Owner of the scheduled time of the inspection.
- .2** If the A/E determines that the Work is Substantially Complete, within 3 business days after the Substantial Completion inspection, the A/E shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion and include a list of Defective, incomplete, or unacceptable Work ("A/E's Punch List"). The A/E's Punch List shall include **(1)** the items on the Contractor's Punch List that are not yet completed or corrected as of the date of the Substantial Completion inspection, and **(2)** comments from the Contracting Authority and Owner.
- .3** The A/E shall submit the Certificate of Substantial Completion to the Contracting Authority, Owner, and Contractor for their written acceptance. Upon their acceptance and consent of the Contractor's Surety, and subject to the Owner's right to withhold payment, the Owner shall release retainage as described under **Section 9.7.2.**
- .4** The A/E's failure to include an item on the A/E's Punch List shall not alter the Contractor's responsibility to complete the Work in accordance with the Contract Documents.
- .5** If the A/E accepts the request and subsequently determines that the Work is not Substantially Complete, the A/E may request compensation for expenses related to excessive Punch List activities. The Contracting Authority may deduct that additional compensation to the A/E from payments then or thereafter due the Contractor. If payments then or thereafter due the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to the Owner.

### **6.27.3 Completion of Punch List Items.**

**6.27.3.1** Within 30 days after the date of Substantial Completion and before the date of Final Contract Completion, the Contractor shall complete all items on the A/E's Punch List. After completing all items on the A/E's Punch List, the Contractor shall provide a written request for Final Inspection of the Work to the A/E.

- .1** If Work on the A/E's Punch List cannot be timely completed, the Contractor shall justify in writing to the reasonable satisfaction of the Contracting Authority and A/E, the reasons the items cannot be completed, and the Contractor may propose, for the Contracting Authority and A/E's approval, a time when the Contractor shall complete those items.
- .2** Within 3 business days after receipt of the request for the Final Inspection of the Work, the A/E shall complete a Final Inspection of the Work for compliance with the Contract Documents.

- 3** If multiple inspections of items on the A/E's Punch List are required due to the Contractor's failure to properly and timely complete them, the Contractor shall pay any additional costs incurred by the A/E, Owner, and Contracting Authority resulting from any attendant delay. The Contracting Authority may deduct those additional costs from payments then or thereafter due the Contractor. If payments then or thereafter due the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to the Owner.

**6.27.3.2** If the Project is administered using the State's web-based project management software, the Contractor shall receive the A/E's Punch List and submit its written request for Final Inspection of the Work, using the "Punch List" business process.

## 6.28 Partial Occupancy

**6.28.1** The Owner may occupy or use a portion of the Project prior to Contract Completion if:

**6.28.1.1** the building authority with jurisdiction over the Project issues a partial certificate of occupancy for the portion of the Project the Owner intends to occupy;

**6.28.1.2** the A/E with the Owner's assistance has provided written notice of the Partial Occupancy to the insurers providing property insurance for the Project; and

**6.28.1.3** the Contracting Authority has received notice of the Partial Occupancy from the A/E and has consented to it.

**6.28.2** Before the Owner commences Partial Occupancy, the Owner, Contracting Authority, A/E, and Contractor shall proceed as described under **Section 6.27** for the area designated for Partial Occupancy.

**6.28.3** The Contractor shall be relieved of the obligation to maintain the area accepted for Partial Occupancy, but shall remain obligated to complete and correct the Work and to carry the insurance required by the Contract Documents during performance of any such Work.

## 6.29 Demonstration and Training, Operating Appurtenances

**6.29.1** The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and final payment, shall perform demonstration and training of the Owner's maintenance personnel as specified in the Contract Documents.

**6.29.2** The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and final payment, shall organize and submit operating appurtenances and loose items related to operation and maintenance of the completed Project to the Owner, including, but not limited to:

**6.29.2.1** keys to door and window hardware, panels, and other devices not directly provided to the Owner from the manufacturer;

**6.29.2.2** operating handles, levers, cranks, specialized wrenches or drivers, remote controls, and similar items; and

**6.29.2.3** extra materials (e.g., attic stock).

## 6.30 Contract Completion

### 6.30.1 Partial Contract Completion.

**6.30.1.1** When items of Work cannot be completed until a subsequent date, the A/E shall prepare a partial Certificate of Contract Completion that shall include a detailed list of the deferred Work and the date(s) by which the Contractor will complete that Work.

**6.30.1.2** The A/E shall submit the partial Certificate of Contract Completion to the Contracting Authority, Owner, and Contractor for their written acceptance. Upon their acceptance of the partial Certificate of Contract Completion and consent of the Contractor's Surety, the Contracting Authority may release payment to the Contractor, as determined in the sole discretion of the Contracting Authority.

### 6.30.2 Final Contract Completion.

**6.30.2.1** When all items on the A/E's Punch List have been completed to the satisfaction of the A/E, all requirements of the Contract Documents have been completed, and the provisions of **Sections 6.25** through **6.29** have been fulfilled, the A/E shall prepare and recommend execution of a final Certificate of Contract Completion.

**6.30.2.2** The date that the Contracting Authority executes the final Certificate of Contract Completion is the date of Contract Completion.

## ARTICLE 7 - MODIFICATIONS

### 7.1 General

#### 7.1.1 Changes in the Work.

**7.1.1.1** The Contracting Authority may order changes in the Work without invalidating the Contract. Subject to the limitations stated in this **Article 7** and elsewhere in the Contract Documents, a change in the Work may be accomplished by a Change Order, Change Directive, or order for a minor change in the Work.

- .1 The Contractor shall proportionately increase the amount of the Bond whenever the Contract Sum is increased.
- .2 If notice of any change affecting the Contract is required by the provision of any Bond, notice is the Contractor's responsibility, and the amount of each applicable Bond shall be adjusted accordingly.

**7.1.1.2** The Contractor shall not proceed with any change in the Work without the Contracting Authority's prior written authorization except as provided under **Sections 1.10** and **7.5**.

**7.1.1.3** Except as provided in **Section 1.10**, the Contractor's failure to obtain prior written authorization for a change in the Work constitutes a waiver by the Contractor of an adjustment to the Contract Sum or Contract Times, or both, for the related Work.

**7.1.1.4** The Contractor shall perform all changes in the Work under the applicable provisions of the Contract Documents, and the Contractor shall proceed promptly with the change unless otherwise provided in the Change Order, Change Directive, or order for a minor change in the Work

#### 7.1.2 Paperwork Consolidation.

**7.1.2.1** Related Modifications, with the same or similar justification (e.g., Owner Request or field resolution), may be consolidated into the same Change Order.

**7.1.2.2** Add and deduct Modifications, with the same or similar justification, may be included on the same Change Order.

**7.1.2.3** Modifications resulting from errors or omissions shall not be combined with other modifications for which the A/E will receive a fee.

#### 7.1.3 Modification Numbering.

**7.1.3.1** The A/E shall assign a number to each Modification, which shall uniquely identify it.

**7.1.3.2** The A/E shall not duplicate or reuse any number throughout the Project or reuse assigned numbers for Proposal Requests that are initiated but cancelled in process.

**7.1.3.3** The number for each Change Order shall be coordinated with any associated Proposal Request or Change Directive.

#### 7.1.4 Modification Log.

**7.1.4.1** The A/E shall create and maintain a Modification Log for the Project, which shall contain the following minimum information:

- .1 number of the Modification;
- .2 a brief description of the Modification;
- .3 cost of the Modification;
- .4 schedule impact of the Modification; and
- .5 dates sent to, and received from, the parties.

#### 7.1.5 Reconciliation of Unit Price Items.

**7.1.5.1** The Contracting Authority may increase, decrease, or delete entirely the scheduled quantities of Work to be performed and materials to be furnished by Change Order.

**7.1.5.2** The A/E shall issue a Change Order to reconcile the difference between the scheduled and actual quantities of Work performed and materials furnished.

**7.1.5.3** If the actual quantity of a Unit Price item differs from the scheduled quantity by 20 percent or more, so that application of the Unit Price to the quantities of Work proposed would create an undue hardship on either the Owner or Contractor, the A/E shall issue a Proposal Request and subsequent Change Order to adjust the Unit Price.

- .1 If a Unit Price is adjusted as described under **Section 7.1.5.3**, the new Unit Price will only apply to the units of Work performed that are **(1)** less than the 20 percent threshold if the Unit Price is changed on



account of an over-estimation of the scheduled quantity of a Unit Price item involved in the Work or (2) in excess of the 20 percent threshold if the Unit Price is changed on account of an under-estimation of the scheduled quantity of a Unit Price item involved in the Work.

**7.1.5.4** If the actual quantity of a Unit Price item exceeds the scheduled quantity by 20 percent or more, the Contractor shall immediately notify the A/E, who shall issue a Change Directive and subsequent Change Order to authorize an adjustment in the scheduled quantity.

## 7.2 Change Order Procedure

**7.2.1** A Change Order is a written instrument prepared by the A/E and executed by the Contracting Authority and Contractor, stating their agreement upon all of the following:

**7.2.1.1** a change in the Work;

**7.2.1.2** the amount of the adjustment of the Contract Sum, if any; and

**7.2.1.3** the extent of the adjustment of the Contract Times, if any.

**7.2.2** Except with the Contracting Authority's written consent as explicitly provided under **Section 7.4.8**, the Contractor is not entitled to reserve any rights or take other similar action with respect to a Change Order if the effect or intent of the reservation or action would be to accommodate a further adjustment of the Contract Sum or Contract Times, or both, after the Contractor signs the Change Order. By signing a Change Order, the Contractor irrevocably certifies that the elements of a Change Order described in **Section 7.2.1** are completely satisfied, and waives all rights, if any, to seek further adjustment of the Contract Sum or Contract Times, or both, at a later date with respect to the associated change in the Work including without limitation on account of the "cumulative impact" of the associated change in the Work in combination with one or more other changes in the Work.

**7.2.3** The A/E shall prepare each Change Order form, attach the supporting documentation, and issue the Change Order to the Contractor for signature.

**7.2.4** If the Contractor is in agreement with the Change Order under **Section 7.2.1**, the Contractor shall sign and return the Change Order to the A/E within 3 days after receiving it.

**7.2.4.1** If the Project is administered using the State's web-based project management software, the Contractor shall indicate its agreement with the Change Order using the "Change Order" or "Contract Modifications" business process.

**7.2.5** When the A/E receives the Change Order signed by the Contractor, the A/E will recommend approval by signing the form and transmitting the Change Order and the revised Change Order Log to the Owner.

**7.2.6** When the Owner receives the Change Order, the Owner may sign the form accepting the Change Order, attach certification of funding, and transmit the Change Order to the Contracting Authority; or, if the Owner does not accept the Change Order, the Owner will reject and return it to the A/E.

**7.2.7** When the Contracting Authority receives the Change Order, the Contracting Authority may sign the form approving the Change Order, and transmit the fully executed Change Order to all signers; or, if the Contracting Authority does not accept the Change Order, the Contracting Authority will reject and return it to the A/E.

**7.2.8** When the Change Order is signed by the Contractor, A/E, Owner, and Contracting Authority, the fully executed Change Order modifies the Contract Documents and authorizes and directs the Contractor to proceed, and the Contractor shall promptly proceed with the associated change in the Work.

## 7.3 Initiation of Change Orders

### 7.3.1 Proposal Request.

**7.3.1.1** The A/E shall prepare and issue a Proposal Request to the Contractor to obtain the Contractor's Proposal for the adjustment of the Contract Sum or the Contract Times, or both, associated with a contemplated Modification.

- .1** In any Proposal for an adjustment of the Contract Sum, the Contractor shall specifically identify the items set forth in **Section 7.7**.
- .2** In any Proposal for an adjustment of the Contract Times, the Contractor shall specifically identify the items set forth in **Section 7.8**.
- .3** The Contractor's cost of preparing and providing Proposals is included in the Contract Sum.

**7.3.1.2** The Contractor shall respond with a Proposal to the A/E and Contracting Authority within 14 days after receiving the Proposal Request. The allowable time for the Contractor's response may be extended by written agreement of the Contractor and A/E.

**7.3.1.3** The Contractor shall hold the Proposal valid and open for acceptance for at least 45 days. The acceptance period may be adjusted by mutual consent of the Contractor and Contracting Authority. The time limits described under this **Section 7.3.1.3** apply only to Proposals submitted in response to a Proposal Request.

**7.3.1.4** A Proposal may be accepted by the Contracting Authority only through a Change Order. A Proposal Request does not authorize the Contractor to proceed with a change in the Work.

**7.3.1.5** If the Contractor does not timely submit a Proposal within the time required in **Section 7.3.1.2**, the Contractor waives its right to an adjustment to the Contract Sum or Contract Times, or both, associated with the contemplated change in the Work.

**7.3.1.6** If the Project is administered using the State's web-based project management software, the Contractor shall respond to a Proposal Request issued by the A/E with its Proposal using the "Change Order" or "Contract Modifications" business process.

### **7.3.2** Request for Change Order.

**7.3.2.1** The Contractor may initiate a change in the Work by submitting written notice to the A/E accompanied by a Proposal meeting the requirements of **Section 7.3.1**.

**7.3.2.2** If the Project is administered using the State's web-based project management software, the Contractor shall initiate its Request for Change Order using the "Change Order" or "Contract Modifications" business process with the "Request for Change Order" workflow.

## **7.4** Change Directives

**7.4.1** A Change Directive is a written order prepared by the A/E and executed by the Contracting Authority directing a change in the Work and may, if necessary:

**7.4.1.1** state a proposed basis for adjustment, if any, in the Contract Sum or Contract Times, or both; or

**7.4.1.2** limit the scope of the change in the Work on a time and materials basis, not to exceed a fixed adjustment of the Contract Sum.

**7.4.2** If a change in the Work must start immediately to avoid an imminent impact to the schedule of the Project, the A/E may prepare a Change Directive for the Contracting Authority's and the Owner's signatures pursuant to **Section 7.4.1**, authorizing the Contractor to proceed.

**7.4.3** A Change Directive shall be used to direct a change in the Work in the absence of total agreement on the terms of a Change Order.

**7.4.3.1** For the purposes of clarity, the Contract refers to a Change Directive as if it is only to be used in the absence of total agreement on the terms of a Change Order concerning the associated change of the Work. A Change Directive may also be used in the absence of agreement as to whether the subject of the Change Directive actually constitutes a change in the Work; such as the situation described under **Section 7.5.3**.

**7.4.4** Upon receipt of a Change Directive, the Contractor shall promptly proceed with the change in the Work involved.

**7.4.5** The Contractor may sign the Change Directive to accept the proposed basis for adjustment, if any, of the Contract Sum or Contract Times, or both. Thereafter, the A/E shall prepare and the A/E, Contracting Authority, Owner, and Contractor shall promptly execute an associated Change Order as described under **Section 7.2**.

**7.4.6** Within 14 days after receiving the Change Directive, the Contractor shall respond with a Proposal meeting the requirements of **Section 7.3.1** to the A/E and Contracting Authority for adjustment of the Contract Sum or Contract Times, or both, on account of the change, unless the Change Directive is performed on a time and materials basis under **Section 7.4.1.2**. If the Change Directive is performed on a time and materials basis, the Contractor shall submit its Proposal within 7 days after completing the Work.

**7.4.6.1** The Proposal for the adjustment of the Contract Sum, if any, shall include: **(1)** written documentation as described under **Section 7.7**; and **(2)** a written statement from the Contractor that the proposed adjustment is the entire adjustment in the Contract Sum associated with the change.

**7.4.6.2** The Proposal for the change in the Contract Times, if any, shall include: **(1)** written documentation as described under **Section 7.8**; and **(2)** a written statement from the Contractor that the proposed adjustment is the entire adjustment of the Contract Times associated with the change.

**7.4.7** If the Contractor does not respond to a Change Directive as required under **Section 7.4.5** or **Section 7.4.6**, the Contracting Authority shall determine the adjustments, if any, of the Contract Sum and Contract Times. If the Contractor does not agree with the Contracting Authority's determination, the Contractor shall initiate a Claim under **Article 8** within 10 days of the date that the Contracting Authority issues its determination, and the Contractor's failure to do so shall constitute an irrevocable waiver of the Claim.

**7.4.8** Pending final determination of the total adjustment of the Contract Times on account of a Change Directive, the period of time not in dispute for that change in the Work may be included in the Construction Progress Schedule accompanied by a Change Order indicating the parties' agreement with part or all of the time adjustment.

**7.4.9** If the Contracting Authority, Owner, and Contractor agree on the adjustments of the Contract Sum and Contract Times associated with a Change Directive, the A/E shall prepare an appropriate Change Order within 7 days after receiving the Contractor's Proposal. The A/E, Contracting Authority, Owner, and Contractor shall promptly sign the Change Order as described under **Section 7.2**.

**7.4.10** If the Contracting Authority, Owner, and Contractor do not agree on the adjustments of the Contract Sum and Contract Times associated with a Change Directive within 60 days after the Change Directive is issued, the Contracting Authority shall determine the adjustments, if any, of the Contract Sum and Contract Times. If the Contractor does not agree with the Contracting Authority's determination, the Contractor shall initiate a Claim under **Article 8** within 10 days of the date that the Contracting Authority issues its determination, and the Contractor's failure to do so shall constitute an irrevocable waiver of the Claim.

**7.4.11** If the Project is administered using the State's web-based project management software, the Contractor shall respond to a Change Directive issued by the A/E with its Proposal using the "Change Order" or "Contract Modifications" business process.

## **7.5 Minor Changes in the Work**

**7.5.1** The A/E may order minor changes in the Work not involving adjustment of the Contract Sum or extension of the Contract Times and not inconsistent with the intent of the Contract Documents. Those changes shall be effected by written order issued to the Contractor.

**7.5.2** The Contractor shall promptly carry out each order for a minor change in the Work if the Contractor agrees that the order does not involve adjustment of the Contract Sum or Contract Times, or both.

**7.5.3** If the Contractor reasonably believes that it would be entitled to an adjustment of the Contract Sum or Contract Times, or both, on account of an order for a minor change in the Work, the Contractor, within 3 business days after receiving the order, shall give the Contracting Authority and A/E written notice of the Contractor's position, and not proceed with the subject Work without first receiving a Change Directive or Change Order related to it.

**7.5.4** The Contractor waives its right to an adjustment of the Contract Sum or Contract Times on account of an order for a minor change in the Work by:

**7.5.4.1** starting the Work that is the subject of the order for a minor change in the Work; or

**7.5.4.2** failing to give the notice described under **Section 7.5.3** within 3 business days after receiving the order for a minor change in the Work.

**7.5.5** If the Project is administered using the State's web-based project management software, the order for a minor change in the Work shall be documented through the "Action Items" business process.

## **7.6 Differing Site Conditions**

**7.6.1** If the Contractor encounters a Differing Site Condition, the Contractor shall stop Work on that Differing Site Condition and give immediate written notice of the condition to the A/E and Contracting Authority.

**7.6.1.1** The Contractor's failure to give notice of the Differing Site Condition as required under this **Section 7.6.1** shall constitute an irrevocable waiver of any associated Claim.

**7.6.1.2** The written notice of a Differing Site Condition under this **Section 7.6.1** shall be required before the notice of Claim under **Article 8**.

**7.6.2** Promptly after receiving notice from the Contractor under **Section 7.6.1**, the A/E shall investigate to determine whether the Contractor has encountered a Differing Site Condition. The A/E shall give written notice of its determination to the Contracting Authority and Contractor within 10 days after completing the investigation.

**7.6.2.1** If the A/E determines that the Contractor has encountered a Differing Site Condition and the Contracting Authority agrees with the A/E's determination, the A/E shall process an appropriate Change Order.

**7.6.2.2** If the A/E determines that the Contractor has encountered a Differing Site Condition but the Contracting Authority disagrees with the A/E's determination, the A/E shall process an appropriate Change Directive through which the Contracting Authority may convey its disagreement with the A/E's determination.

**7.6.2.3** If the A/E determines that the Contractor has not encountered a Differing Site Condition and the Contractor does not agree with that determination, the Contractor must initiate a Claim under **Article 8** within 10 days of the date that the A/E issues its determination.

## 7.7 Change Order Cost or Credit Determination

### 7.7.1 General.

**7.7.1.1** The maximum cost or credit resulting from a change in the Work shall be determined as described below.

- .1 Proposals shall include the information required by **Section 7.7.1.4**.
- .2 A Unit Price Proposal shall only be valid when incorporated into the Contract by Change Order.
- .3 The maximum cost or credit includes all compensation for impact costs. Additional costs for impacts shall not be allowed.

**7.7.1.2** The Contractor shall not assign any portion of the Work to another Person whereby the Contractor would benefit directly or indirectly from the double application of charges for overhead or profit.

**7.7.1.3** The Contracting Authority may require notarized invoices for material costs and may audit the records of the Contractor and Subcontractors.

**7.7.1.4** For each change in the Work, the Contractor shall furnish a detailed Proposal itemized on the **Proposal Worksheet Summary Form (Contractor)** published by the Ohio Facilities Construction Commission through which the Contractor shall document the related changes in the Contract Sum as described under **Section 7.7.2**. Any Subcontractor pricing shall be itemized on the appropriate **Proposal Worksheet Summary Form**.

**7.7.1.5** **Section 7.7.2** establishes the exclusive and maximum amount that the Owner shall pay for any Change Order, including, but not limited to, all amounts for interference with, delay, hindrance, disruption, or impact of the Work ("Pricing Criteria"). These Pricing Criteria also govern the value of deduct Change Orders and the Contractor's entitlement to additional compensation or damages through the Claims and dispute resolution processes on account of changes in the Work. In order to expedite the review and approval process, Proposals shall be prepared in the categories and order listed in **Section 7.7.2**.

### 7.7.2 Pricing Criteria.

**7.7.2.1 Contractor Personnel Costs:** The Contractor's on-Site management (including supervision and administrative personnel) not subject to prevailing wage under ORC Chapter 4115. These costs will be calculated on an hourly basis according to the rates acceptable to the Contracting Authority.

- .1 In no event will the Contractor be entitled to an increase in the Contract Sum on account of Contractor Personnel Costs unless the Contractor actually incurs additional Contractor Personnel Costs solely on account of the associated change in the Work.
- .2 Under no conditions will the increase under this **Section 7.7.2.1** exceed those additional Contractor Personnel Costs the Contractor actually incurs.

**7.7.2.2 Labor:** Field labor directly involved in the Work based upon the actual rate of pay to the worker. If the Project is subject to payment of prevailing wage rates, field labor shall be paid according to the relevant classification of labor as established in the applicable prevailing wage determination for the Project locality, as determined by the Ohio Department of Commerce, Wage and Hour Bureau.

- .1 In no event will the Contractor be entitled to an increase in the Contract Sum on account of labor costs unless the Contractor actually incurs additional labor costs solely on account of the associated change in the Work.
- .2 Under no conditions will the increase under this **Section 7.7.2.2** exceed those additional labor costs the Contractor actually incurs.
- .3 The cost for supervision above the level of working forepersons (such as general forepersons, superintendent, project manager, etc.) is included in the adjustment under **Section 7.7.2.1** for the Contractor and under **Section 7.7.2.10** for Subcontractors.

**7.7.2.3 Fringes:** Fringe benefit credit for labor provided under **Section 7.7.2.2** is only allowable for prevailing wage fringe benefits pursuant to ORC Chapter 4115, including, but not limited to, Health and Welfare, vacation,

apprenticeship training, and certain types of pension plans. The parties shall defer to the Ohio Department of Commerce's policy on which benefits are granted fringe benefit credit. Each fringe benefit for which credit is requested shall be calculated on an hourly basis and listed as a separate line item. The Contractor shall submit documentation supporting the calculation of the amounts for each fringe benefit for each worker classification, including labor provided by Subcontractors.

**7.7.2.4 Allowable Payroll Expenses:** Allowable payroll expenses for labor provided under **Section 7.7.2.2** including payroll taxes as well as other benefits that are required by Applicable Law, such as federal and state Unemployment and Workers' Compensation shall each be a separate line item and shall not be credited for compliance with ORC Chapter 4115.

**7.7.2.5 Equipment Rentals:** All charges for certain non-owned heavy or specialized equipment at up to 100 percent of the documented rental cost. No rental charges shall be allowed for hand tools, minor equipment, simple scaffolds, etc. Downtime due to repairs, maintenance and weather delays shall not be allowed. Contractor shall submit copies of actual paid invoices to substantiate rental costs.

**7.7.2.6 Owned Equipment:** All charges for certain heavy or specialized equipment owned by the Contractor or Subcontractor performing the Work at up to 100 percent of the cost listed by the current edition of the Associated Equipment Distributors' *AED Green Book* heavy equipment rental rates. No recovery shall be allowed for hand tools, minor equipment, simple scaffolds, etc. The longest period of time that the equipment is to be required for the Work shall be the basis for the pricing. Downtime due to repairs, maintenance, and weather delays shall not be allowed.

**7.7.2.7 Trucking:** A reasonable delivery charge or per-mile trucking charge for delivery of required materials or equipment. Charges for use of a pick-up truck shall not be allowed.

**7.7.2.8 Materials:** The actual cost (including all discounts, rebates or related credits) of all materials incorporated into the changed Work. Documentation shall show costs, quantities, or Unit Prices of all items, as appropriate.

- .1 The cost or credit for reusable materials (e.g., concrete form lumber, shoring, or temporary enclosures) shall be limited to 33 percent of the material cost for each use.

**7.7.2.9 Contractor's General Conditions Costs:** The Contractor's General Conditions Costs to the extent attributable to an associated change in the Contract Time for achievement of Substantial Completion resulting from the change in the Work.

- .1 In no event shall the Contract Sum adjustment per day of Contract Time adjustment exceed an amount equal to **(1)** the sum of the General Conditions Costs line items in the Contractor's Schedule of Values approved by the Contracting Authority, **(2)** divided by the total number of days of the original Contract Time for achievement of Substantial Completion.
- .2 The Contractor shall **(1)** exclude the Bond premium from the Schedule of Values for the purposes of the calculation under **Section 7.7.2.9.1**, and **(2)** include the actual adjustment of the Bond premium attributable to an associated change in the Contract Sum.
- .3 If the Contractor purchases the builder's risk insurance for the Project, the Contractor shall **(1)** exclude the builder's risk insurance premium from the Schedule of Values for the purposes of the calculation under **Section 7.7.2.9.1**, and **(2)** include the actual adjustment of the builder's risk insurance premium attributable to an associated change in the Contract Sum.

**7.7.2.10 Subcontractor Overhead and Profit:** Adjustment of the Contract Sum on account of a change in Subcontractor-performed Work shall include the Subcontractor's aggregate overhead and profit allowance equal to 15 percent of the sum of the Subcontractor's costs described under **Sections 7.7.2.2** through **7.7.2.8** that are associated with that changed Work.

- .1 The allowance applies to each Subcontractor tier.
- .2 The allowance covers: the costs required to schedule and coordinate the Work, telephone, telephone charges, facsimile, telegrams, postage, photos, photocopying, hand tools, simple scaffolds (one level high), tool breakage, tool repairs, tool replacement, tool blades, tool bits, home office estimating and expediting, home office clerical and accounting support, home office labor (management, supervision, engineering), all other home office expense, legal services, travel, and parking expenses.
- .3 An exception is allowed for shop or engineering labor on items in **Section 7.7.2.10.2**, which shall not be subject to Prevailing Wage rates for steel fabricators, sheet metal fabricators, and sprinkler system fabricators performing work off-site. Recovery for these matters shall be allowed on an hourly basis under items in **Sections 7.7.2.2**, **7.7.2.3**, and **7.7.2.4** of these Pricing Criteria.
- .4 An exception is allowed for field supervision labor on items in **Section 7.7.2.10.2**, for those portions of the Change Order Work that will be performed, or was performed, at times when the superintendent is not

required to be on site under **Section 6.4**, including but not limited to overtime hours due to acceleration and extensions of the Contract Times. Recovery for this matter will be allowed on an hourly basis under items in **Sections 7.7.2.2, 7.7.2.3, and 7.7.2.4** of these Pricing Criteria.

**7.7.2.11 Contractor's Fee:** Adjustment of the Contract Sum on account of a change in the Work shall include an allowance for the Contractor's Fee equal to 10 percent of the sum of the costs described under **Sections 7.7.2.1** through **7.7.2.10** that are associated with that changed Work.

**7.7.2.12 Miscellaneous:** Adjustment of the Contract Sum on account of a change in Work may include the following costs with no allowance for Contractor's Fee under **Section 7.7.2.11** or Subcontractor overhead and profit under **Section 7.7.2.10**.

- .1 The premium portion only for approved overtime (labor and fringes). The straight time portion is included in items in **Sections 7.7.2.2, 7.7.2.3, and 7.7.2.4**.
- .2 State sales tax shall be allowed on items as defined by **Section 12.7**.

**7.7.3** Costs that shall not be reimbursed for Change Order Work include the following:

**7.7.3.1** Voluntary employee deductions including, but not limited to, deductions for charitable donations or U.S. savings bonds.

**7.7.3.2** Employee profit sharing.

## 7.8 Time Extension

**7.8.1** Every adjustment of the Contract Times associated with any change in the Work shall be determined as provided in this **Section 7.8**, which establishes the Contractor's maximum entitlement for any change in the Work, including without limitation all adjustments for interference, delay, hindrance, or disruption of the Work. This **Section 7.8** also governs time adjustments for deduct Change Orders and the Contractor's entitlement to additional time through the claims and dispute resolution processes on account of changes in the Work.

**7.8.2** The Contractor shall substantiate all changes in the Contract Times with:

**7.8.2.1** a written description of the nature of the interference, disruption, hindrance or delay;

**7.8.2.2** identification of Persons and events responsible for the interference, disruption, hindrance or delay;

**7.8.2.3** date, or anticipated date, of commencement of the interference, disruption, hindrance or delay;

**7.8.2.4** identification of activities by schedule activity number and name on the Construction Progress Schedule, which may be affected by the interference, disruption, hindrance or delay, or new activities created by the interference, disruption, hindrance or delay and the relationship with existing activities;

**7.8.2.5** anticipated duration of the interference, disruption, hindrance or delay and of any remobilization period;

**7.8.2.6** specific number of days of extension requested and specific number of days for remobilization requested;

**7.8.2.7** recommended action to avoid or minimize any future interference, disruption, hindrance or delay; and

**7.8.2.8** a detailed written proposal as described under **Section 7.7** for an increase in the Contract Sum which would fully compensate the Contractor for all costs of acceleration of the Work needed to completely overcome the associated delay, if any.

**7.8.3 Critical Path.** Time extensions shall depend upon the extent to which the Work on the critical path of the Construction Progress Schedule is affected, if applicable.

**7.8.3.1** A Change Order granting a time extension may provide that the Contract Times shall be extended for only those specific elements so interfered with, disrupted, hindered, or delayed and related remobilization and that remaining Milestone dates shall not be altered and may further provide for adjustment of Liquidated Damages.

## 7.9 Examination and Audit of Contractor's Records

**7.9.1** The Contracting Authority and Owner may examine all books, records, documents and other data of the Contractor and its Subcontractors related to the bidding, pricing, or performance of the Work for the purpose of evaluating any Contractor Payment Request, Proposal, Modification, or Claim.

**7.9.2** The above referenced materials shall be made available at the office of the Contractor or Subcontractor, as applicable, at all reasonable times for inspection, audit, and reproduction until the expiration of 6 years after the date of Substantial Completion of all Work.

**7.9.2.1** The Contractor shall maintain, and require its Subcontractors to maintain, complete and accurate business records at its principal place of business. If the principal place of business is greater than 50 miles from the Site, the Contractor shall timely make records available, and shall require its Subcontractors to timely make records available, at the office of the Contracting Authority or Owner upon request for the records.

**7.9.3** To the extent that the Contractor or Subcontractor, as applicable, informs the Contracting Authority or Owner in writing that any documents provided to the Contracting Authority or Owner are trade secrets, the Contracting Authority or Owner shall treat these documents, to the extent permitted by law, as trade secrets of the Contractor or Subcontractor, as applicable.

**7.9.3.1** If a dispute arises with any other Person about whether that Person should be given access to the documents, the Contractor or Subcontractor as applicable, shall indemnify the Contracting Authority and Owner against all costs, expenses, and damages, including but not limited to attorneys' fees, incurred or paid by reason of that dispute.

**7.9.4** The right of inspection, audit, and reproduction extends to all documents necessary to permit adequate evaluation of the cost of pricing data submitted along with the computations and projections used therein.

**7.9.5** If the Contract has been terminated, in whole or in part, the records relating to the Work terminated shall be made available to the Contracting Authority or Owner for a period of 6 years from the date of any applicable final settlement or payment, as applicable.

**7.9.6** Records that relate to disputes, litigation, or settlement of Claims arising out of the performance of the Work shall be made available until the dispute, litigation or Claims have been finally decided or settled.

## **ARTICLE 8 - DISPUTE RESOLUTION**

### **8.1 Initiation of a Claim**

**8.1.1** Every Claim shall accrue upon the date of occurrence of the event giving rise to the Claim.

**8.1.2** Except as provided under **Section 1.10**, the Contractor shall initiate every Claim by giving written notice of the Claim to the A/E and Contracting Authority within 10 days after occurrence of the event giving rise to the Claim, with the following exceptions:

**8.1.2.1** The 10-day time limit on initiating a Claim arising from a determination of the Contracting Authority concerning a Change Directive begins to run on the date that the Contracting Authority issues its determination under **Section 7.4.7** or **Section 7.4.10**, as applicable.

**8.1.2.2** The 10-day time limit on initiating a Claim arising from the response of the A/E to a RFI begins to run on the date that the A/E issues the A/E's response to the RFI.

**8.1.2.3** The 10-day time limit on initiating a Claim arising from the A/E's determination concerning a Differing Site Condition begins to run on the date that the A/E issues the A/E's determination under **Section 7.6**.

**8.1.3** The Contractor's written notice of a Claim shall provide the following information to permit timely and appropriate evaluation of the Claim, determination of responsibility, and opportunity for mitigation:

**8.1.3.1** nature and anticipated amount of the impact, including all costs for any interference, disruption, hindrance, or delay, which shall be calculated in accordance with **Section 7.7** and be a fair and reasonably accurate assessment of the damages suffered or anticipated by the Contractor;

**8.1.3.2** identification of the circumstances responsible for causing the impact, including, but not limited to, the date or anticipated date, of the commencement of any interference, disruption, hindrance, or delay;

**8.1.3.3** identification of activities on the Construction Progress Schedule that will be affected by the impact or new activities that may be created and the relationship with existing activities;

**8.1.3.4** anticipated impacts and anticipated duration of any interference, disruption, hindrance, delay, or impact, and any remobilization period; and

**8.1.3.5** recommended action to avoid or minimize any interference, disruption, hindrance, delay, or impact.

**8.1.4** The Contractor's failure to initiate a Claim as and when required under this **Section 8.1** shall constitute the Contractor's irrevocable waiver of the Claim.

**8.1.5** The A/E, in consultation with the Contracting Authority, shall respond to the written notice of the Claim within a reasonable time of receipt, but not to exceed 10 days.

## 8.2 Substantiation of Claims

**8.2.1** Within 30 days after the initiation of a Claim, the Contractor shall submit 4 copies of all information and statements required to substantiate a Claim as provided in this **Article 8** and all other information that the Contractor believes substantiates the Claim. The Contractor shall file the 4 copies by delivery of 1 copy to the A/E, 1 copy to the Owner, and 2 copies to the Contracting Authority.

**8.2.2** The Contractor shall substantiate all of its Claims by providing the following minimum information:

**8.2.2.1** a narrative of the circumstances, which gave rise to the Claim, including without limitation the start date of the event or events and the actual or anticipated finish date;

**8.2.2.2** detailed identification of the Work (e.g., activity codes from the Construction Progress Schedule) affected by the event giving rise to the Claim;

**8.2.2.3** copies of the Contractor's daily log (**Section 6.2.17**) for each day of impact;

**8.2.2.4** copies of relevant correspondence and other information regarding or supporting Contractor entitlement;

**8.2.2.5** copies of the Contractor's most recent income statement, including segregated general and administrative expenses for the most recent reporting period, and for the period of the Contract, if available, and similar information for any Subcontractor claim included; and

**8.2.2.6** the notarized certification described under **Section 8.5.1.1**.

**8.2.3** The Contractor's failure to comply with the requirements of this **Section 8.2** shall constitute an irrevocable waiver of any related Claim.

## 8.3 Substantiation of Claims for Increase of the Contract Sum

**8.3.1** The Contractor shall substantiate each Claim for an increase of the Contract Sum with:

**8.3.1.1** written documentation as described under **Section 7.7** of the actual additional direct and indirect costs to the Contractor due to the event giving rise to the Claim;

**8.3.1.2** a written statement from the Contractor that the increase requested is the entire increase in the Contract Sum associated with the Claim; and

**8.3.1.3** the general substantiation documentation described under **Section 8.2**.

**8.3.2** The Contractor's failure to comply with the requirements of this **Section 8.3** shall constitute an irrevocable waiver of any related Claim.

## 8.4 Substantiation of Claims for Extension of the Contract Times

**8.4.1** The Contractor shall substantiate each Claim for an extension of the Contract Times with:

**8.4.1.1** written documentation as described under **Section 7.8** of the actual delay to the critical path of the Construction Progress Schedule due to the event giving rise to the Claim;

**8.4.1.2** a detailed written Proposal as described under **Section 7.7** for an increase in the Contract Sum that would fully compensate the Contractor for all costs of acceleration of the Work needed to completely overcome the associated delay together with a statement consistent with **Section 8.3.1.2**;

**8.4.1.3** a written statement from the Contractor that the extension requested is the entire extension of the Contract Times associated with the Claim; and

**8.4.1.4** the general substantiating documentation described under **Section 8.2**.

**8.4.2** In addition to the requirements of **Section 8.4.1**, if adverse weather conditions are the basis for a Claim for additional time, the Contractor shall document the Claim with data substantiating that weather conditions were abnormal for the period, could not have been reasonably anticipated, and had an adverse effect on a critical element of the scheduled construction. The support for and evaluation of all adverse weather Claims shall be based upon average weather conditions during the 5 years immediately preceding the dates at issue in the Claim as those weather conditions were recorded at the government-controlled weather-recording facility nearest to the Site.

**8.4.3** The Contractor's failure to comply with the requirements of this **Section 8.4** shall constitute an irrevocable waiver of any related Claim.



**8.5 Certification of the Claim**

**8.5.1** The Contractor shall certify each Claim within 30 days after initiating the Claim under **Section 8.1** or before Contract Completion, whichever is earlier, by providing the notarized certification specified in **Section 8.5.1.1**, signed and dated by the Contractor:

**8.5.1.1** “The undersigned Contractor certifies that the Claim is made in good faith; that the supporting data is accurate and complete to the best of the Contractor’s knowledge and belief; that the amount requested is a fair, reasonable, and necessary adjustment for which the Contractor believes the State is liable; and that the undersigned is duly authorized to certify the Claim on behalf of the Contractor.”

**8.5.2** The date that the Contractor’s certified and fully substantiated Claim is received by the Contracting Authority, or the date that the Contractor is required to certify and fully substantiate a Claim pursuant to **Sections 8.2.1** and **8.5.1**, shall trigger the 120-day period for exhaustion of administrative remedies pursuant to ORC Section 153.16(B).

**8.5.3** The Contractor’s failure to comply with the requirements of this **Section 8.5** shall constitute an irrevocable waiver of any related Claim.

**8.6 Delay and Delay Damage Limitations; Derivative Claims**

**8.6.1** Subject to other provisions of the Contract, the Contractor will be entitled to an extension of the Contract Times on account of delay in the commencement or progress of Work on the critical path of the Construction Progress Schedule caused by acts of Nature or the public enemy, acts of the government not arising from the Contractor’s failure to comply with Applicable Law, fires, floods, epidemics, weather, and labor disputes beyond the Contractor’s control.

**8.6.2** Notwithstanding any other provision of the Contract Documents to the contrary, the Contractor shall not be entitled to an increase in the Contract Sum, or an extension of the Contract Times, or both:

**8.6.2.1** on account of the impact of any normal adverse weather on any of the Work or on account of the impact of any abnormal adverse weather on Work not on the critical path;

**8.6.2.2** to the extent that a delay occurs concurrently with a delay attributable to the Contractor; or

**8.6.2.3** on account of the delay of any Work not on the critical path.

**8.6.3** Notwithstanding any other provision of the Contract Documents to the contrary, the Contractor shall not be entitled to an increase in the Contract Sum or any type of damages on account of a delay in the commencement or progress of Work on the critical path unless **(1)** the delay is caused by the Owner and **(2)** the delay was not authorized or permitted under the Contract.

**8.6.4** Notwithstanding any other provision of the Contract Documents to the contrary, the Contractor shall not be entitled to an increase in the Contract Sum or any type of damages arising from a delay in the commencement or progress of any of the Work caused by the occurrence or non-occurrence of an event beyond the Owner’s control such as acts of Nature or the public enemy, acts of the government, fires, floods, epidemics, labor disputes, unusual delivery delays, weather, or damages caused by the Contractor.

**8.6.5** Derivative Claims. Notwithstanding any other provision of the Contract to the contrary, if the Owner prosecutes a claim, suit, or appeal against a Separate Consultant or Separate Contractor to recover damages the Contractor suffers on account of the acts or neglects of a Separate Consultant or Separate Contractor or a person or entity for whom either is legally responsible, the Owner’s liability to the Contractor shall not exceed the amount the Owner actually recovers from the Separate Consultant or Separate Contractor on account of those damages less the costs the Owner incurs recovering them. The Owner is not obligated to prosecute any such claim, suit, or appeal.

**8.7 Liquidated Damages**

**8.7.1** If the Contractor fails to achieve a Milestone within the associated Contract Time, it would be difficult, if not impossible, to determine the Owner’s resulting damages. Therefore, if the Contractor fails to achieve a Milestone within the associated Contract Time, the Contractor shall (at the Owner’s option) pay to or credit the Owner the Liquidated Damages per day sum determined according to the following schedule for each day that the Contractor fails to achieve a Milestone within the associated Contract Time.

Contract Sum	Liquidated Damages per day
Less than \$1,000,000	\$500
From \$1,000,000.01 to \$2,000,000	\$1,000
From \$2,000,000.01 to \$5,000,000	\$2,000

Contract Sum	Liquidated Damages per day
From \$5,000,000.01 to \$10,000,000	\$5,000
From \$10,000,000.01 to \$20,000,000	\$7,500
From \$20,000,000.01 to \$50,000,000	\$10,000
More than \$50,000,000	\$15,000

**8.7.2** If the Contractor simultaneously fails to achieve two or more Milestones, the Owner shall be entitled to recover the sum of the associated Liquidated Damages per day rates.

**8.7.3** The Liquidated Damages described in this **Section 8.7** are only intended to compensate the Owner for the direct damages it incurs as a result of the Contractor's failure to achieve the Milestones within their associated Contract Times.

**8.7.4** The Liquidated Damages described in this **Section 8.7** are not intended to compensate the Owner for any damages the Owner incurs on account of **(1)** any claims attributable to the Contractor that are brought by others including Separate Consultants and Separate Contractors or **(2)** any failure of the Contractor to timely, properly, and completely perform the Contract other than the failure to achieve the Milestones within their associated Contract Times.

**8.7.5** The parties acknowledge that the above-listed Liquidated Damages per day sums are not penalties, and they each irrevocably waive the right (if any) to challenge the validity and enforceability of those Liquidated Damages per day sums. Notwithstanding any other provision of the Contract Documents to the contrary, if a court determines that the Liquidated Damages per day sums or their application are void and unenforceable, the Owner shall be entitled to recover the actual damages that it incurs on account of the Contractor's failure to achieve one or more of the Milestones within the Contract Times.

**8.7.6** In addition to other rights that the Owner may have relative to the Liquidated Damages, the Contracting Authority may deduct the Liquidated Damages from the Contract Sum as the damages accrue. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall immediately pay the amount of the insufficiency to the Owner.

## 8.8 Mutual Waiver of Consequential Damages

**8.8.1** Except as provided under **Section 8.8.2**, the Owner and Contractor each waive against the other all Claims for consequential damages that may arise out of or relate to this Contract.

**8.8.1.1** The Owner's waiver includes Claims for loss of use, income, profit, revenue, financing, cost of capital, business and reputation, management and employee productivity, and consequential damages arising from termination of the Contract or related to insolvency.

**8.8.1.2** The Contractor's waiver includes Claims for unabsorbed home-office overhead; any other form of overhead in excess of that specifically provided for under **Section 7.7**; delay damages except as otherwise specifically provided for in **Section 8.6**; increased cost of funds for the Project; lost opportunity to work on other projects; losses of financing, business, and reputation; loss of profit except anticipated profit arising directly from properly performed Work; loss of bonding capacity; and consequential damages arising from termination of the Contract or related to insolvency.

**8.8.2** Notwithstanding **Section 8.8.1**, this **Section 8.8**:

**8.8.2.1** does not apply to any damages that would be covered by insurance provided in connection with the Project if the Contract did not include **Section 8.8.1**;

**8.8.2.2** does not apply to the Contractor's indemnity obligations for third-party claims against the Indemnified Parties even if those claims are for damages that **Section 8.8.1** would otherwise preclude;

**8.8.2.3** does not preclude the Owner's recovery of Liquidated Damages under **Section 8.7**; and

**8.8.2.4** does not apply to Claims for damages arising from the Owner's or the Contractor's gross negligence or willful misconduct.

**8.8.3** This **Section 8.8** shall survive termination of the Contract.

## 8.9 Review of the Claim

**8.9.1** The A/E shall review the Claim and prepare a written analysis of its content, which shall include:

**8.9.1.1** a narrative of the A/E's examination of the facts giving rise to the Claim;

**8.9.1.2** identification of relevant Contract Documents and language;

**8.9.1.3** an analysis of whether the Contractor complied with the requirements of the Contract Documents pertaining to Claim initiation and substantiation including, without limitation, the issues of entitlement to, and calculation of, adjustments of the Contract Sum, Contract Times, or both;

**8.9.1.4** an analysis of claimed additional labor, materials, and equipment for the scope of the Work items described;

**8.9.1.5** an analysis of any time extension for any interference, disruption, hindrance, impact, or delay claimed (to include the calculation of any concurrent delays affecting entitlement);

**8.9.1.6** a concluding opinion regarding Contractor entitlement to, and the appropriateness and reasonableness of all, or any part of, the Claim; and

**8.9.1.7** an appendix containing copies of contemporaneous documentation supporting the concluding opinion.

**8.9.2** The A/E shall submit the written analysis to the Project Manager no more than 30 days after receiving the Contractor's substantiated and certified Claim.

## **8.10 Claim Decision**

**8.10.1** The Project Manager shall examine the Contractor's Claim and A/E's analysis.

**8.10.2** The Project Manager shall approve or deny all, or any part, of the Contractor's Claim and forward a written decision to the Contractor, A/E, Owner, and Contracting Authority within 14 days after receiving the A/E's analysis.

**8.10.2.1** The Project Manager may employ independent resources to assist in its review, or refer evaluation of the Claim to a consultant.

**8.10.3** If the Contractor and Owner agree with the Project Manager's decision, the decision shall be incorporated into a Change Order.

**8.10.4** Any Claim remaining unresolved after completion of the process described under this **Section 8.10** shall be subject to Claim decision review as described under **Section 8.11**.

## **8.11 Claim Decision Review**

**8.11.1** The Contractor may request review of the Project Manager's decision by written notice delivered by certified mail within 14 days of the Project Manager's decision.

**8.11.1.1** If the Project is administered by the Commission, jointly administered by the Commission and a public school district, or locally administered by authority granted to an agency of the state of Ohio by the Commission, the written notice shall be delivered to the Executive Director of the Commission.

**8.11.1.2** If the Project is locally administered by an Institution of Higher Education under ORC Section 3345.50 or ORC Section 3345.51, the written notice shall be delivered to the Institutional Designee who will review the Project Manager's decision instead of the Commission.

**8.11.2** The Commission or Institutional Designee, if applicable, shall schedule and conduct a meeting within 30 days after receiving the Contractor's request for review.

**8.11.2.1** The Commission or Institutional Designee may employ independent resources to assist in the meeting and review.

**8.11.3** The Commission or Institutional Designee, if applicable, shall determine the final disposition of the Contractor's request for review and provide a written decision to the Contractor and Owner within 14 days after the meeting.

**8.11.4** The decision of the Commission or Institutional Designee is the final administrative decision of the Contracting Authority as described under ORC Section 153.12(B).

**8.11.5** If the Contractor and Owner agree with the Commission's or the Institutional Designee's decision, the decision shall be incorporated into a Change Order.

**8.11.6** Any Claim remaining unresolved after completion of the process described under this **Section 8.11** shall be subject to litigation, which may be preceded by Alternative Dispute Resolution ("ADR") as described under **Section 8.13**.

## **8.12 Delegation**

**8.12.1** No provision of this **Article 8** shall prevent the Executive Director from delegating the duties or authorities of the Commission to any other person selected at the Executive Director's sole discretion.

### 8.13 Alternative Dispute Resolution

**8.13.1** The intent of the ADR process is to resolve disputes quickly and equitably in a manner agreed upon by all parties to the dispute.

**8.13.2** The ADR procedure shall be accepted by all of the Project's key stakeholders.

**8.13.3** The accepted ADR methods shall not include binding arbitration; alter any of the requirements for Claim initiation, certification, and substantiation; or alter the administrative process described under this **Article 8**.

**8.13.4** The following forms of non-binding ADR may be considered:

**8.13.4.1 Negotiation:** If negotiation is warranted, the parties to the dispute may agree to a progressive level of negotiators, invested with the authority to agree to a determination of an adjustment in the Contract Sum, Contract Times, or both.

**8.13.4.2 Dispute Review Board:** If a dispute review board is the accepted ADR procedure, or the process to follow when negotiations are unsuccessful, the parties to the dispute shall jointly select 3 neutral third parties to monitor the progress of construction and provide recommended resolutions to disputes that are brought before them. The costs of the dispute review board shall be shared equally among the parties to the dispute.

**8.13.4.3 Mediation:** If mediation is the accepted ADR procedure, or the process to follow when negotiations are unsuccessful, the parties to the dispute shall accept a neutral third party to mediate the dispute. The costs of mediation shall be shared equally among the parties to the dispute.

**8.13.4.4** Another ADR procedure accepted by all of the Project's key stakeholders.

### 8.14 Audit of the Claim

**8.14.1** All Claims shall be subject to audit at any time following filing of the Claim, whether or not the Claim is part of a lawsuit.

**8.14.2** The audit may be performed by employees of the Contracting Authority or by a consultant engaged by the Contracting Authority.

**8.14.3** The audit may begin upon 10-days' notice to the affected Contractor or affected Subcontractor.

**8.14.4** The Contractor shall cooperate with the request.

**8.14.5** Failure of the Contractor or Subcontractor to produce sufficient records to allow the Contracting Authority to audit and verify a Claim shall constitute an irrevocable waiver of the Claim or portion of the Claim that could not be completely audited.

**8.14.6** The Contractor shall make available to the Contracting Authority all Contractor and Subcontractor documents related to the Claim including, without limitation, the following documents:

**8.14.6.1** daily time sheets and superintendent's daily reports;

**8.14.6.2** union agreements, if any, and employer agreements;

**8.14.6.3** insurance, welfare, fringes, and benefits records;

**8.14.6.4** payroll register;

**8.14.6.5** earnings records;

**8.14.6.6** payroll tax returns;

**8.14.6.7** material invoices, purchase orders, Subcontracts, and all material and supply acquisition contracts;

**8.14.6.8** material cost distribution worksheets;

**8.14.6.9** equipment records (list of Contractor equipment, rates, etc.);

**8.14.6.10** vendor rental agreements and Subcontractor invoices;

**8.14.6.11** Subcontractor payment certificates;

**8.14.6.12** canceled checks (payroll and vendors);

**8.14.6.13** job cost report;

**8.14.6.14** job payroll ledger;

**8.14.6.15** general ledger, general journal, (if used) and all subsidiary ledgers and journals together with all supporting documentation pertinent to entries made in these ledgers and journals;

- 8.14.6.16 cash disbursements journal;
- 8.14.6.17 financial statements for all years reflecting operations on the Project;
- 8.14.6.18 income tax returns for all years reflecting operations on the Project;
- 8.14.6.19 depreciation records on all equipment utilized whether the records are maintained by the Contractor, its accountant, or others;
- 8.14.6.20 if a source other than depreciation records is used to develop costs for the Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all other source documents;
- 8.14.6.21 all documents that reflect the Contractor's actual profit and overhead during the years the Project was being performed;
- 8.14.6.22 all documents related to the preparation of the Contractor's Bid, including the final calculations on which the Bid was based, unless the documents are placed in escrow under provisions of the Instructions to Bidders;
- 8.14.6.23 all documents that relate to the Claim together with all documents that support the amount of damages as to the Claim;
- 8.14.6.24 worksheets used to prepare the Claim establishing the cost components for items of the Claim including, but not limited to, labor, fringes, benefits and insurance, materials, equipment, Subcontractors, and all documents that establish the periods of time, individuals involved, the hours and rate of pay for the individuals; and
- 8.14.6.25 all other documents required by the Contracting Authority to reasonably review the Claim.

### 8.15 False Certification of the Claim

8.15.1 If the Contractor falsely certifies all or any part of a Claim, the portion of the Claim falsely certified shall be denied, and may be sufficient cause for the State to debar the Contractor from future State contracting opportunities as permitted by law.

### 8.16 Performance and Payment

8.16.1 The Contractor shall proceed with the Work during any dispute resolution process, unless otherwise agreed by the Contractor and Contracting Authority in writing.

8.16.2 The Contracting Authority shall continue to make payment of any undisputed amounts in accordance with the Contract Documents pending final resolution of a Claim, unless otherwise agreed by the Contractor and Contracting Authority in writing.

## ARTICLE 9 - COMPENSATION AND PAYMENT

### 9.1 Allowances

9.1.1 The Contract Sum includes the Allowances (if any) identified in the Contract.

9.1.2 All Allowances include the cost to the Contractor (less any applicable trade discounts) of materials and equipment required by the Allowances to be delivered at the Site, and all applicable taxes.

9.1.3 The Contractor's Fee and costs for unloading and handling on the Site, labor, installation costs, and other expenses contemplated for the Allowances are not in the stated Allowance amounts but are otherwise included in the Contract Sum.

9.1.4 Before final payment, an appropriate Change Order will be issued to reconcile the Contract Sum so that it reflects actual amounts due to the Contractor on account of Work covered by Allowances.

### 9.2 Unit Prices

9.2.1 Where the Contract provides that all or part of the Work is to be Unit Price Work, initially the Contract Sum will include for all Unit Price Work (1) an amount equal to the sum of the established Unit Prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract plus (2) the Contractor's Fee on that Unit Price Work.

9.2.2 The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Sum. The Contracting Authority will determine the actual quantities and classifications of Unit Price Work performed by Contractor.

**9.2.3** The Contractor's Fee on account of Unit Price Work is not in the stated Unit Price amounts but are otherwise included in the Contract Sum.

**9.2.4** Before final payment, an appropriate Change Order will be issued as described under **Section 7.1.5** to reconcile the Contract Sum so that it reflects actual amounts due to the Contractor on account of Unit Price Work actually performed.

### 9.3 Schedule of Values

**9.3.1** Within 10 days after receipt of the Notice to Proceed, or other period as mutually agreed by the Contractor and Contracting Authority, the Contractor shall submit to the A/E a Schedule of Values on a form published by the Commission, with separate amounts shown for labor and materials for each branch of Work, following the numbers and titles of the Construction Specifications Institute's *MasterFormat* for individual work results, or *UniFormat* for assemblies in place.

**9.3.1.1** The Contractor shall clearly indicate on the Schedule of Values, the amount(s) allocated, including separate items for Contractor's Fee (overhead and profit), for each EDGE-certified Business used in the performance of the Work. The amount(s) shall indicate labor and materials, as appropriate.

**9.3.2** The grand total shown on the Schedule of Values shall equal the total Contract Sum. The Contracting Authority may use the approved Schedule of Values to determine the cost or credit to the Owner resulting from any change in the Work.

**9.3.2.1** The first items shall be a breakdown of General Conditions Costs.

**9.3.2.2** The amounts for labor and materials shall accurately reflect the cost for each item. Separate items shall not be shown for Contractor's Fee, except when Work is performed or materials are supplied by an EDGE-certified Business, pursuant to **Section 9.3.1.1**. Contractor's Fee shall be included in the totals for labor and materials.

**9.3.2.3** If the material allocation exceeds 55 percent of the Contract Sum, the Contractor shall provide, upon request, sufficient information to support the higher percentage.

**9.3.2.4** Subcontract Work shall show amounts for labor and materials. Fringe benefits shall be shown as a part of labor costs.

**9.3.2.5** When more than one major structure is included in the Work, the Contractor shall subdivide the Schedule of Values accordingly, with cost details for each structure shown separately.

**9.3.2.6** The line items shall be coordinated with line items in the Project Schedule, which may require division of items of Work by area of the Project by floor, phase, or other appropriate area.

**9.3.2.7** Mechanical and electrical Work shall be included in separate line items for all major pieces of equipment, and group smaller equipment items by type.

**9.3.2.8** Line items shall be included for each Allowance, Punch List Work, Project Record Document Submittals, delivery of attic stock, and specified demonstrations and training.

**9.3.3** The A/E may return the Schedule of Values to the Contractor for re-submittal if it does not meet the requirements or contains insufficient items or details of the Work, or approve the Schedule of Values if the A/E determines that it conforms to this **Section 9.3**.

**9.3.4** No payment shall be made until the A/E has approved the Contractor's Schedule of Values.

**9.3.5** If the Project is administered using the State's web-based project management software, the Contractor shall submit its Schedule of Values, using the "Contract Schedule of Values" business process.

### 9.4 Contractor Payment Request

**9.4.1** The Contractor may submit a Contractor Payment Request for Work performed based upon the Schedule of Values to the A/E each month or upon another interval approved by the Contracting Authority. When the rate of Work and amount involved is sufficient that it is considered appropriate by the Contracting Authority, the Contractor may submit Contractor Payment Requests twice a month.

**9.4.1.1** The Contractor shall support each Contractor Payment Request with documentation substantiating the Contractor's right to payment. The Contractor shall supply additional documentation as the A/E may request in connection with each payment to the Contractor.

**9.4.1.2** The Contracting Authority may require proof of the renewal of required insurance as a condition precedent to payment.

**9.4.1.3** The Contractor shall attach certified payroll reports for the relevant period to 1 copy of each Contractor Payment Request, see **Document 00 73 43 - Prevailing Wage Requirements**.

**9.4.1.4** The Contractor may list on the Contractor Payment Request any Change Orders approved and performed prior to submission of the Contractor Payment Request.

**9.4.1.5** The Contractor shall submit its Contractor Payment Request using the Contractor Payment Request form or forms current at the time of each application and as provided by the Contracting Authority in the manner prescribed by the Contracting Authority.

**9.4.1.6** If the Project is not administered using the State's web-based project management software, the Contractor shall submit 1 draft copy of its Contractor Payment Request ("Pencil Copy") to the A/E not less than 1 week prior to submitting multiple copies of its Contractor Payment Request. The A/E shall review the Pencil Copy and provide comments to the Contractor within 3 days of receiving it. The Contractor shall incorporate the A/E's comments into its Contractor Payment Request prior to submitting multiple copies for payment.

**9.4.1.7** The Contractor shall clearly indicate on the Contractor Payment Request, the amount(s) requested for each EDGE-certified Business used in the performance of the Contract. The amount(s) shall indicate labor and materials, as appropriate.

**9.4.1.8** The Contractor shall submit an electronic copy of the Contractor Payment Request to the A/E with its paper copies of the Contractor Payment Request for collection and reporting of information used for contract compliance evaluation and statistical purposes. The Contractor may issue the copy in any electronic media acceptable to the Contracting Authority.

**9.4.2** Payments, except for lump sum items, in Unit Price Contracts shall be made to the Contractor only for the authorized actual quantities of Work performed or materials furnished in accordance with the Contract Documents.

**9.4.3** Subject to **Section 9.8**, the Owner shall pay an approved Contractor Payment Request within 30 days from the date the A/E recommends acceptance of the Contractor Payment Request.

**9.4.3.1** Payments due and not paid to the Contractor, through no fault of the Contractor, within the 30 day period shall, from the date payment is due, bear simple interest at the applicable statutory rate.

**9.4.4** Notwithstanding any other provision of the Contract Documents, partial payments made pursuant to this **Section 9.4** constitutes neither acceptance of any Defective Work, nor a waiver of any rights set forth in the Contract Documents or otherwise provided by Applicable Law.

**9.4.5** The Contracting Authority and Owner may audit Contractor Payment Requests as described under **Section 7.9**.

**9.4.6** If the Project is administered using the State's web-based project management software, the Contractor shall submit its Contractor Payment Request, using the "Contractor Pay Request" or "Applications for Payment" business process.

## **9.5 Labor Payments**

**9.5.1** Partial payments to the Contractor for labor performed under either a Unit Price or lump sum Contract shall be made at the rate of 92 percent of the amount invoiced through the Contractor Payment Request that shows the Work is 50 percent complete.

**9.5.2** After the Work is 50 percent complete, as evidenced by payments of at least 50 percent of the Contract Sum including approved Change Orders to date, no additional funds shall be retained from payments for labor.

## **9.6 Material Payments**

**9.6.1** The Owner shall pay the Contractor at the rate of 100 percent of the scheduled value for materials incorporated into the Project.

**9.6.2** The Owner shall pay the Contractor at the rate of 92 percent of the invoice cost, not to exceed the scheduled value in a Unit Price or lump sum Contract, for materials delivered to the Site, or other off-site storage location approved by the A/E, provided the Contractor provides the following information with the Contractor Payment Request:

**9.6.2.1** a list of the fabricated materials consigned to the Project, giving the place of storage, together with copies of invoices, in order to verify quantity and cost; and

**9.6.2.2** a certification of materials stored off-site, prepared by the Contractor and signed by the A/E to evidence that the materials are in conformity with the Specifications and have been tagged with the Project name and number for

delivery to the Project. The Contractor shall directly reimburse the A/E for all costs incurred to visit a storage site, other than the areas adjacent to the Project.

**9.6.2.3** The Owner shall pay the balance of the scheduled value when the materials are incorporated into and become a part of the Project.

**9.6.3** When payment is allowed for materials delivered to the Site or other approved off-site storage location but not yet incorporated into the Project, the materials are the property of the Owner.

**9.6.3.1** The Owner may, at its sole discretion, retain any material not ultimately incorporated into the Project or return it to the Contractor for credit of an amount proportionate to the value of the extra materials.

## 9.7 Retainage

**9.7.1** If the total Contract Sum is \$15,000 or more, when the Contract is 50 percent complete, all funds retained for faithful performance of the Work, in accordance with **Section 9.5.1**, shall be deposited in an escrow account with a bank in the state in accordance with the terms and conditions provided in an escrow agreement executed by the Contractor, Contracting Authority, and applicable bank.

**9.7.2** When the Contractor has achieved Substantial Completion of all Work, and there is no other reason to retain funds; upon request of the Contractor, the funds retained in connection with that Work shall be released from escrow and paid to the Contractor, withholding only that amount necessary to assure faithful completion in the sole discretion of the Contracting Authority, including but not limited to compliance with **Section 6.25.2**.

**9.7.3** Upon consent by the Contractor's Surety, the Contracting Authority may reduce the amount of funds retained for the faithful performance of Work by 50 percent of the amount of funds required to be retained, provided the Contractor's Surety remains responsible for all damages that may be caused due to default by the Contractor, including, but not limited to, the following:

**9.7.3.1** completion of the Work;

**9.7.3.2** all interference, disruption, hindrance and delay claims;

**9.7.3.3** all Liquidated Damages; and

**9.7.3.4** all additional expenses incurred by the State.

## 9.8 Payments Withheld

**9.8.1** The A/E may recommend to the Contracting Authority that payments be withheld from, or Liquidated Damages be assessed against, a Contractor Payment Request.

**9.8.2** The Contracting Authority may decline to approve any Contractor Payment Request or part thereof, or nullify any previous Contractor Payment Request, in whole or in part, to the extent necessary in the Contracting Authority's sole opinion to protect the Owner from loss because of:

**9.8.2.1** Defective Work not remedied;

**9.8.2.2** damage caused by the Contractor;

**9.8.2.3** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

**9.8.2.4** reasonable evidence that the Work will not be completed within the Contract Times, and that the unpaid balance would not be adequate to cover damages under the Contract Documents for the anticipated delay;

**9.8.2.5** failure to comply with Applicable Law including, but not limited to, the requirements of ORC Chapter 4115;

**9.8.2.6** failure to timely submit EDGE Participation Reports in accordance with **Section 1.8.2**;

**9.8.2.7** failure to timely identify the Contractor's proposed Subcontractors in accordance with **Section 4.1.1**;

**9.8.2.8** failure to timely approve a Construction Progress Schedule in accordance with **Section 6.5**;

**9.8.2.9** failure to carry out the Work in accordance with the Contract Documents; or

**9.8.2.10** that which is permitted under other provisions of the Contract Documents.

**9.8.3** If the Contractor remedies the basis for withholding payment under **Section 9.8.2** to the Contracting Authority's satisfaction, the Owner shall pay the amounts withheld.



## 9.9 Final Contractor Payment Request

**9.9.1** The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and to final payment, shall complete all requirements of the Contract Documents.

**9.9.1.1** The Contractor and each of its Subcontractors, regardless of tier, shall execute a Payment Release Affidavit to certify that the Contractor and each of its Subcontractors, regardless of tier, have complied with all requirements of ORC Chapter 4115, and to certify that all of its Subcontractors have been paid in full for all Work performed or materials furnished for the Project.

**9.9.2** The Owner shall pay the final Contractor Payment Request within 30 days from the date the A/E recommends acceptance of the final Contractor Payment Request.

**9.9.2.1** Payments due and not paid to the Contractor within the 30 day period shall bear interest from the date payment is due under the Contract Documents at the applicable statutory rate.

**9.9.3** Acceptance of final payment by the Contractor or a Subcontractor constitutes the payee's waiver of all claims against the State except those previously made in writing under **Article 8** and identified by that payee as unsettled at the time of the final Contractor Payment Request.

**9.9.4** If the Project is administered using the State's web-based project management software, the Contractor shall submit its final Contractor Payment Request, using the "Contractor Pay Request" or "Applications for Payment" business process.

## ARTICLE 10 - BONDS, INSURANCE, AND INDEMNIFICATION

### 10.1 Payment and Performance Bonds

**10.1.1** Before signing the Agreement, the Contractor shall provide the Bond required under Applicable Law and below:

**10.1.1.1** If the Contractor provided **Document 00 43 13 - Bid Security Form** as its Bid Guaranty then that form shall be the Bond.

**10.1.1.2** If the Contractor provided another form of Bid Guaranty, then **Document 00 61 13 - Performance and Payment Bond Form** shall be the Bond.

**10.1.1.3** Each Surety under the Bond shall be licensed to do business in Ohio and satisfactory to the Contracting Authority.

**10.1.1.4** If there is more than one Surety under the Bond, each of them shall be jointly and severally liable as surety under the Bond.

**10.1.1.5** The penal sum of the Bond, when initially submitted, shall be equal to one-hundred percent of the Contract Sum.

**10.1.2** The Contractor shall submit with the executed Bond **(1)** a certified copy of the authority to act (power of attorney) of the agent signing the Bond on behalf of the Surety and **(2)** a current and signed Certificate of Compliance under ORC Section 9.311 issued by the Ohio Department of Insurance showing the Surety is licensed to do business in Ohio.

**10.1.3** If the Contract Sum increases at any time such that it exceeds the penal sum of the Bond, the Contractor shall cause the penal sum of the Bond to be increased such that the penal sum equals one-hundred percent of the increased Contract Sum.

**10.1.4** Any time the Contractor increases the penal sum of the Bond under **Section 10.1.3**, the Contractor shall deliver to the Contracting Authority written consent of the affected Surety or Sureties confirming the increased penal sum. The Contracting Authority's receipt of that written consent is a condition precedent to the Owner's obligation to pay the Contractor for any portion of the Work associated with the increase.

**10.1.5** If notice of any change affecting the Contract is required by any Surety or by the provision of any Bond, the Contractor shall provide that notice.

### 10.2 Contractor's General Insurance Requirements

**10.2.1** Throughout the performance of the Work or longer as may be described below, the Contractor shall obtain, pay for, and keep in force, the minimum insurance coverage described in this **Article 10**.

**10.2.1.1** Each requirement of this **Article 10** applies to Subcontractors just as it applies to the Contractor.

**10.2.1.2** If a Subcontractor's usual insurance coverage does not meet the minimum coverage requirements, before entering into an agreement with that Subcontractor, the Contractor shall submit to the Contracting Authority **(1)** a certificate of insurance evidencing the insurance the Subcontractor will carry without additional compensation and **(2)** if the Contracting Authority requests, a written proposal from the Subcontractor to provide coverage that meets the minimum coverage requirements. The Contracting Authority will decide whether to accept the non-conforming insurance coverage or the proposal to provide conforming coverage.

**10.2.1.3** On a case-by-case basis, the Contracting Authority and Contractor may agree to adjust the below requirements for any particular Subcontractor.

**10.2.2** Before starting the Work on the Site, upon renewal of any policy, and upon a change of any insurance carrier, the Contractor shall deliver to the Contracting Authority certificates evidencing that the required insurance is in force.

**10.2.3** With the exception of government-controlled workers compensation coverage:

**10.2.3.1** the Contractor shall place the insurance with companies that **(1)** are satisfactory to the Contracting Authority, **(2)** hold an A.M. Best Rating of A-, X, or higher, and **(3)** are authorized to conduct business in Ohio;

**10.2.3.2** the policies shall be endorsed to require the Contractor's insurance carrier to **(1)** provide 30-days' written notice to the Contracting Authority (as certificate holder) of the cancellation or non-renewal of the insurance and **(2)** provide at least 10-days' written notice to the Contracting Authority (as certificate holder) of the cancellation of the insurance for non-payment of premium; and

**10.2.3.3** within 30 days of the Contracting Authority's request, the Contractor shall submit insurance-company certified copies of the policies, the policy endorsements, loss-run reports, or all three.

**10.2.4** The Contractor shall pay all deductibles, or self-insured retentions, or both contained in the Contractor's policies of insurance required or provided in connection with the Project. The Contracting Authority reserves the right to approve or reject all levels of self-insured retention, captive insurance programs, or other alternative risk financing the Contractor may use to comply with any insurance requirement.

**10.2.5** The Contractor shall pay a proportionate share of the deductibles, or self-insured retentions, or both contained in any insurance policy the Contracting Authority purchases for the Project. The Contractor's proportionate share will derive from the percentage of the associated claim or loss attributable to the alleged or actual negligence of the Contractor or a Subcontractor.

**10.2.6** The Contracting Authority and Owner do not represent that required coverage or limits are adequate to protect the Contractor.

**10.2.7** Failure of the Contracting Authority to demand a certificate or other evidence of full compliance with the insurance requirements or failure of Contracting Authority to identify a deficiency from evidence that is provided shall not be construed as a waiver of the Contractor's obligation to maintain the required insurance.

**10.2.8** The Contracting Authority may terminate the Contract for cause on account of the Contractor's failure to maintain required insurance.

### **10.3 Contractor's Minimum Coverage Requirements**

**10.3.1** Workers Compensation. The Contractor shall maintain workers compensation coverage meeting the requirements of Applicable Law.

**10.3.2** Employers Liability Coverage. The Contractor shall maintain employers liability coverage with **(1)** an each-accident limit of not less than \$1,000,000, **(2)** a disease each-employee limit of not less than \$1,000,000, and **(3)** a disease policy limit of not less than \$1,000,000.

**10.3.3** Commercial General Liability. The Contractor shall maintain commercial general liability ("CGL") coverage that provides **(1)** an each-occurrence limit of not less than \$1,000,000, **(2)** a general-aggregate limit of not less than \$2,000,000, and **(3)** a products and completed-operations aggregate limit of not less than \$2,000,000.

**10.3.3.1** The CGL insurance shall be written on ISO occurrence form CG 00 01 10 01 or a substitute form, providing at least equivalent coverage for liability arising from premises, operations, independent contractors, products/completed-operations, personal and advertising injury, and liability assumed under an insured contract.

**10.3.3.2** The Contractor shall include the State, Contracting Authority, Owner, and A/E as additional insureds under the CGL policy using ISO endorsement CG 20 10 07 04 and ISO endorsement CG 20 37 07 04 or a substitute form(s) providing equivalent coverage.

**10.3.3.3** The CGL policy shall be endorsed using ISO endorsement CG 25 03 or a substitute form providing equivalent coverage to provide that the general aggregate limit applies separately to each of the insured's projects.

**10.3.3.4** The CGL insurance shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs that cover the additional insured(s).

**10.3.3.5** The CGL policy shall not exclude coverage to the additional insured(s) for bodily injury or property damage arising out of the products/completed-operations hazard.

**10.3.3.6** The Contractor shall maintain the CGL insurance in effect for no less than 5 years after the earlier of the termination the Contract or Substantial Completion of all Work.

**10.3.4 Business Automobile Liability.** The Contractor shall maintain business automobile ("BA") coverage written on ISO form CA 00 01 10 01 or a substitute form, providing at least equivalent coverage with a limit of not less than \$1,000,000 each accident.

**10.3.4.1** The coverage shall extend to any auto.

**10.3.4.2** The Contractor shall include the State, Contracting Authority, Owner, and A/E as additional insureds under the BA policy.

**10.3.5 Umbrella/Excess Liability.** The Contractor may employ an umbrella/excess liability policy to achieve the above-required minimum coverage.

**10.3.5.1** The Contractor shall maintain umbrella/excess liability coverage with a limit of not less than \$2,000,000 (in addition to the above-required limits) if the Work (or the Work to be performed by the Subcontractor) includes any of the following:

- .1 brick/block masonry;
- .2 exterior caulking/sealant;
- .3 cast-in-place or precast concrete;
- .4 curtain wall;
- .5 dampproofing/waterproofing;
- .6 electrical;
- .7 elevator;
- .8 exterior glass and/or glazing;
- .9 exterior marble, granite, and/or other stonework;
- .10 miscellaneous metals;
- .11 plaster/stucco;
- .12 plumbing;
- .13 HVAC;
- .14 roofing and/or sheet metal;
- .15 scaffolding;
- .16 spray-on fireproofing;
- .17 sprinkler and/or fire protection; or
- .18 structural steel and/or metal deck.

**10.3.5.2** The Contractor shall maintain umbrella/excess liability coverage with a limit of not less than \$5,000,000 (in addition to the above-required limits) if the Work (or the Work to be performed by the Subcontractor) includes any of the following:

- .1 caissons and/or piles;
- .2 demolition;
- .3 excavation and/or utility work;
- .4 sheeting, shoring, and/or underpinning;
- .5 window washing equipment; or
- .6 wrecking.

**10.3.6 Contractor's Pollution Liability.** If the Work includes environmentally sensitive, hazardous types of activities (such as demolition, exterior insulation finish systems, Asbestos abatement, storage-tank removal, or similar activities), or involves Hazardous Materials, the Contractor shall maintain a contractor's pollution liability ("CPL") policy with **(1)** a per-claim limit of not less than \$1,000,000 and **(2)** an annual-aggregate limit of not less than \$1,000,000, covering the

acts, errors and/or omissions of the Contractor for damages (including from mold) sustained by the Owner by reason of the Contractor’s performance of the Work.

**10.3.6.1** The CPL policy shall have an effective date, which is on or before the date that the Contractor first started to perform any Project-related services.

**10.3.6.2** Upon submission of the associated certificate of insurance and at each policy renewal, the Contractor shall advise the Contracting Authority in writing of any actual or alleged claims that may erode the CPL policy’s limits.

**10.3.6.3** The Contractor shall maintain the CPL insurance in effect for no less than 5 years after the earlier of the termination of the Contract or Substantial Completion of all Work.

**10.3.7 Professional Liability—Contractor.** The Contractor shall maintain professional liability insurance (including without limitation for sprinkler and/or fire protection and other design-build work included in the Work) without design-build exclusions with limits not less than as identified in the following table:

Contract Sum	Each Claim	Annual Aggregate
Up to \$50,000,000	\$1,000,000	\$2,000,000
More than \$50,000,000	\$2,000,000	\$4,000,000

**10.3.7.1** The professional liability policy shall have an effective date on or before the date that the Contractor first started to provide any Project-related services.

**10.3.7.2** Upon submission of the associated certificate of insurance and at each policy renewal, the Contractor shall advise the Contracting Authority in writing of any actual or alleged claims that may erode the professional liability policy’s limits.

**10.3.7.3** The Contractor shall maintain the professional liability insurance in effect for no less than 5 years after the earlier of the termination of the Contract or Substantial Completion of all Work.

**10.3.7.4** If the Contractor is not authorized under Applicable Law to directly provide professional design services, the Contractor may satisfy the requirements of this **Section 10.3.7** by providing a contractor’s professional liability insurance policy.

**10.3.7.5** If the Contractor is a joint venture:

- .1 the Contractor may meet the requirements of this **Section 10.3.7** by providing a PL policy under which each joint venturer is the insured; or
- .2 each joint venturer shall individually meet the requirements of this **Section 10.3.7** by providing a PL policy **(1)** under which the individual joint venturer is the insured and **(2)** that covers that joint venturer’s interests in the joint venture by endorsement or otherwise. The certificate of insurance shall reflect that the PL policy covers the joint venturer’s interest in the joint venture.

*Example:* Assume that the Contractor **(1)** is the “XY joint venture” of company “X” and company “Y”; and **(2)** is required under **Section 10.3.7** to maintain PL insurance limits of \$1M/\$2M. In order to comply with **Section 10.3.7.5.2**, “X” must maintain PL insurance limits of \$1M/\$2M and “Y” must maintain PL insurance limits of \$1M/\$2M.

**10.3.7.6** If the Contractor is a limited-liability company, which members consist of two or more separate firms:

- .1 the Contractor may meet the requirements of this **Section 10.3.7** by providing a PL policy under which the limited-liability company is the insured; or
- .2 each member of the limited-liability company shall individually meet the requirements of this **Section 10.3.7** by providing a PL policy **(1)** under which the individual member is the insured and **(2)** that covers that member’s interests in the limited-liability company by endorsement or otherwise. The certificate of insurance shall reflect that the PL policy covers the member’s interest in the limited-liability company.

*Example:* Assume that the Contractor **(1)** is the “XY limited-liability company,” the members of which are “X” and “Y”; and **(2)** is required under **Section 10.3.7** to maintain PL insurance limits of \$1M/\$2M. In order to comply with **Section 10.3.7.6.2**, “X” must maintain PL insurance limits of \$1M/\$2M and “Y” must maintain PL insurance limits of \$1M/\$2M.

**10.3.8 Professional Liability—Subcontractors.** If the Work to be performed by a Subcontractor includes any professional design services (including without limitation sprinkler and/or fire protection and other design-build work) the Subcontractor shall maintain professional liability insurance without design-build exclusions with limits not less than as identified in the following table:

Subcontract Sum	Each Claim	Annual Aggregate
Up to \$50,000,000	\$1,000,000	\$2,000,000
More than \$50,000,000	\$2,000,000	\$4,000,000

**10.3.8.1** The professional liability policy shall have an effective date on or before the date that the Subcontractor first started to provide any Project-related services.

**10.3.8.2** Upon submission of the associated certificate of insurance and at each policy renewal, the Contractor shall advise the Contracting Authority in writing of any actual or alleged claims that may erode the Subcontractor's professional liability policy's limits.

**10.3.8.3** The Subcontractor shall maintain the professional liability insurance in effect for no less than 5 years after the earlier of the termination of the Contract or Substantial Completion of all Work.

**10.3.8.4** If the Subcontractor is not authorized under Applicable Law to directly provide professional design services, the Subcontractor may satisfy the requirements of this **Section 10.3.7.5** by providing a contractor's professional liability insurance policy.

**10.3.9 Aviation Liability.** If the Contractor or a Subcontractor uses aircraft, including helicopters, in performance of the Work, the Contractor shall maintain aircraft or aviation liability coverage in an amount of no less than \$10,000,000. The Contracting Authority and Owner will not be liable for any damage to any aircraft owned, leased, rented, or borrowed by the Contractor or a Subcontractor.

**10.3.10 Watercraft Liability.** If the Contractor or a Subcontractor uses watercraft in performance of the Work, the Contractor shall maintain watercraft liability coverage including protection and indemnity insurance in an amount of no less than \$5,000,000. The Contracting Authority and Owner will not be liable for any damage to any watercraft owned, leased, rented, or borrowed by the Contractor or Subcontractor.

**10.3.11 Equipment Coverage.** The Contracting Authority and Owner will not insure or be liable for damage to any Contractor or Subcontractor owned, leased, rented, or borrowed tools, equipment, or vehicles. The Contractor and Subcontractors are solely responsible for maintaining all insurance necessary to cover their tools, equipment, and vehicles.

**10.3.12 Ocean Marine Insurance.** If the shipment of equipment or materials for the Work will not be covered by the builder's risk insurance required under **Section 10.4**, the Contractor shall maintain ocean marine insurance to the Site including cost, insurance, and freight with limits of not less than an amount equal to the full replacement cost of equipment/materials shipped to final destination point. The insurance shall include the following minimum requirements:

**10.3.12.1** all-risk basis including war risk and all forms of terrorism;

**10.3.12.2** coverage for general average and salvage charges;

**10.3.12.3** "on deck" coverage;

**10.3.12.4** warehouse-to-warehouse coverage;

**10.3.12.5** coverage to include losses from strikes, riots, and civil commotions ("SR&CC coverage");

**10.3.12.6** coverage to include losses from free of capture and seizure warranty ("FC&S Warranty coverage");

**10.3.12.7** "Inchmaree" clause;

**10.3.12.8** sue and labor;

**10.3.12.9** "both-to-blame" coverage;

**10.3.12.10** free of particular average;

**10.3.12.11** inland coverage including on-land shipment, port storage, and barge transit upon inland waterways; and

**10.3.12.12** damage by saltwater and rainwater perils and cargo sweat.

**10.3.13 Additional Property Insurance.** For any demolition, blasting, excavating, tunneling, shoring, or similar operations, the Contractor shall provide and maintain Property Damage Liability insurance with a limit of liability equal to the limit as specified in the applicable sections of **Article 10**.

## 10.4 Builder's Risk Insurance

**10.4.1** The Contractor shall provide and maintain, during the progress of the Work and until Contract Completion, a builder's risk insurance policy to cover all Work in the course of construction including false-work, temporary buildings and structures, and materials used in the construction process, stored on or off-site, or while in transit. This insurance shall be on a special cause of loss form that provides coverage on an open perils basis insuring against the direct physical loss of, or damage to, covered property including, but not limited to, theft, vandalism, malicious mischief, earthquake, tornado, lightning, explosion, breakage of glass, flood, collapse, water damage, and hot and cold testing. This insurance shall be written on a replacement cost basis and shall also include debris removal, and/or demolition occasioned by enforcement of Applicable Law.

**10.4.1.1** The amount of coverage shall be not less than the total completed value of the Project, including the value of permanent fixtures and decorations, with a deductible of not more than \$25,000 per occurrence. Any deductible over the amount specified shall be authorized in writing by the Owner and Contracting Authority.

**10.4.1.2** Coverage shall include a provision to pay the reasonable extra costs of acceleration and expediting temporary and permanent repairs to, or permanent replacement of, damaged property. This shall include overtime wages and the extra cost of "express" or other means for rapidly transporting materials and supplies necessary to the repair or replacement.

**10.4.1.3** Coverage shall include "soft cost endorsement" including, but not limited to, the reasonable extra costs of the A/E and reasonable Contractor extension or acceleration costs.

**10.4.1.4** Coverage shall include material in transit or stored off-site and identified for the Project.

**10.4.1.5** Coverage shall waive all rights between the Owner, Contracting Authority, Contractor, and Subcontractors at any tier, for damages caused by fire or any other perils to the extent of actual recovery of any insurance proceeds under the policy.

**10.4.1.6** Coverage shall include appropriate sub-limits for installation coverage.

**10.4.1.7** Coverage shall include provisions for mechanical or electrical breakdown, or boiler system testing.

**10.4.1.8** Coverage shall include temporary structures and scaffolding, along with collapse coverage.

**10.4.1.9** Coverage shall be primary to all other applicable insurance.

**10.4.1.10** The builder's risk policy shall specifically permit and allow for Partial Occupancy by the Owner prior to Contract Completion and coverage shall remain in effect until all punch list items are completed.

**10.4.1.11** The Contractor's tools and equipment shall not be covered under the builder's risk policy. It is the Contractor's sole responsibility to maintain such coverage, which shall be included in its Overhead (a component of Contractor's Fee) and not included as a separate item in the Contractor's Schedule of Values.

**10.4.2** If the Contractor is involved solely in the installation of material and equipment and not in new building construction, the Contractor shall purchase and maintain a builder's risk, builder's risk-renovations, or installation floater insurance policy. The policy shall comply with the provisions of **Section 10.4.1**.

## 10.5 Waivers of Subrogation

**10.5.1** To the fullest extent permitted by Applicable Law, the Contractor waives all rights against the Owner, Contracting Authority, and their agents and employees for damages to the extent covered by any insurance, except rights to the proceeds of that insurance. All policies shall accomplish the waiver of subrogation by endorsement or otherwise.

**10.5.2** The Owner, Contracting Authority, and Contractor waive all rights against each other for damages caused by fire or other perils to the extent of actual recovery of any insurance proceeds under any property insurance, inland marine insurance, or builder's risk insurance applicable to the Work.

## 10.6 Indemnification for Injury or Damage

**10.6.1** To the fullest extent permitted by Applicable Law, the Contractor shall indemnify, defend, and hold harmless the Indemnified Parties from and against all claims, costs, damages, losses, fines, penalties, and expenses (including but not limited to all fees and charges of attorneys and other professionals, and all court, arbitration, or other dispute-resolution costs) arising out of or in connection with the Project, provided that any such claim, cost, damage, loss, fine, penalty, or expense is attributable to:

**10.6.1.1** bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property but only to the extent caused by the negligent acts, errors, or omissions of the Contractor or a person or entity for whom the Contractor may be liable;

**10.6.1.2** infringement of patent rights or copyrights by the Contractor or a person or entity for whom the Contractor may be liable; or

**10.6.1.3** a violation of Applicable Law but only to the extent attributable to the Contractor or a person or entity for whom the Contractor may be liable.

**10.6.2** The Contractor's indemnification obligation under **Section 10.6** exists regardless of whether or not and the extent to which the claim, damage, loss, fine, penalty, or expense is caused in part by a party indemnified under **Section 10.6**. But nothing in **Section 10.6** obligates the Contractor to indemnify any individual or entity from and against the consequences of that individual or entity's own negligence.

**10.6.3** The Contractor's obligations under **Section 10.6** shall not extend to the liability of the A/E, A/E's consultants, agents, representatives, or employees for negligent preparation or approval of Drawings, Specifications, Change Orders, opinions, and any other responsibility of the A/E, except to the extent covered by the Contractor's insurance.

**10.6.4** In claims against an Indemnified Party by any direct or indirect employee (or the survivor or personal representative of that employee) of the Contractor or a person or entity for whom the Contractor may be liable, the indemnification obligation under **Section 10.6** will not be limited by a limitation on the amount or type of damages, compensation, or benefits payable under workers' compensation acts, disability benefit acts, or other employee benefit acts.

**10.6.5** The Contractor's indemnification obligation under **Section 10.6** will not be limited by any insurance policy provided or required in connection with the Project.

**10.6.6** The Contractor's obligations under **Section 10.6** shall not negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to an Indemnified Party.

**10.6.7** The Contractor's indemnification obligation under **Section 10.6** will survive termination of the Contract and Contract Completion.

**10.6.8** The Contracting Authority may deduct from the Contract Sum the claims, damages, losses, fines, penalties, and expenses for which the Contractor is liable under **Section 10.6**. If those claims, damages, losses, fines, penalties, and expenses exceed the unpaid balance of the Contract Sum, the Contractor shall immediately pay the difference to the Owner.

## ARTICLE 11 - SUSPENSION AND TERMINATION

### 11.1 Suspension of the Work

**11.1.1** The Contracting Authority, without cause and without prejudice to any other right or remedy it may have, may order the Contractor in writing to suspend, delay, or interrupt performance of the Work in whole or in part for such period as the Contracting Authority may determine.

**11.1.1.1** If the Contracting Authority suspends the Work under this **Section 11.1.1** and the Contractor complies with **Article 8**, the Contract Sum and Contract Times shall be adjusted for increases in the cost and time caused by the suspension, delay, or interruption. The adjustment of the Contract Sum, however, shall not include profit (a component of Contractor's Fee).

**11.1.1.2** Notwithstanding the foregoing, no adjustment shall be made to the Contract Sum or Contract Times to the extent that:

- .1 performance was, or could have been, suspended, delayed, or interrupted by a cause for which the Contractor is responsible; or
- .2 an equitable adjustment is made or denied under another provision of the Contract.

**11.1.1.3** If the Contracting Authority suspends the Work under this **Section 11.1.1** and the Contractor submits a proper Contractor Payment Request, subject to all other provisions of the Contract Documents, the Contractor shall be entitled to payment of compensation due under the Contract Documents for Work performed before the suspension based upon the Schedule of Values.

**11.1.2** The Contracting Authority, without prejudice to any other right or remedy it may have, may order the Contractor in writing to suspend, delay, or interrupt the performance of the Work in whole or in part for such period as the Contracting Authority may determine for any of the following reasons: **(1)** Defective Work; **(2)** the Contractor is causing undue risk of damage to any part of the Project or adjacent area; **(3)** the Contractor fails to furnish or perform the Work

in such a way that the complete Work will conform to the requirements of the Contract Documents; or **(4)** any other cause the Contracting Authority reasonably believes justifies suspension.

**11.1.2.1** The Contracting Authority's exercise of its right to suspend the Work under this **Section 11.1.2** shall not entitle the Contractor to any adjustment of the Contract Sum, Contract Times, or both.

**11.1.2.2** If the Contracting Authority is adjudged to have improperly suspended the Work under this **Section 11.1.2**, the suspension shall be deemed to have been a suspension under **Section 11.1.1**.

**11.1.3** Upon receipt of notice of suspension under this **Section 11.1**, the Contractor shall cease Work on the suspended activities and take all necessary or appropriate steps to limit disbursements and minimize respective costs. The Contractor shall furnish a report to the Contracting Authority, within 5 days of receiving the notice of suspension, describing the status of the Work, including, but not limited to, results accomplished, resulting conclusions, and other information as the Contracting Authority may require.

**11.1.4** The Contracting Authority's right to stop the Work shall not give rise to any duty to exercise the right for the benefit of the Contractor or any other party, and the Contracting Authority's exercise or failure to exercise the right shall not prejudice any of the Contracting Authority's other rights.

## 11.2 Termination for Convenience

**11.2.1** The Contracting Authority may, at any time, terminate the Contract in whole or in part for the Owner's convenience and without cause, at any time upon 10 days' written notice to the Contractor.

**11.2.2** Upon receipt of the notice of termination for convenience, the Contractor shall immediately proceed with performance of the following duties in accordance with instructions from the Contracting Authority:

**11.2.2.1** cease operation as specified in the notice;

**11.2.2.2** place no further orders and enter into no further subcontracts for materials, labor, services, or facilities, except as necessary to complete continued portions of the Project;

**11.2.2.3** terminate all subcontracts and orders to the extent they relate to the Work terminated;

**11.2.2.4** proceed with Work not terminated; and

**11.2.2.5** take actions that may be necessary, or that the Contracting Authority may direct, for the protection and preservation of the terminated Work.

**11.2.3** Upon termination, the Contracting Authority shall pay the Contractor in accordance with the Schedule of Values for Work completed, including any retained funds, and the value of materials ordered and delivered, less any salvage credit the Contractor may receive for them.

**11.2.3.1** All materials, equipment, facilities, and supplies at the Site or stored off-site, for which the Contractor has received payment, shall become the property of the Owner.

**11.2.3.2** The Contractor is entitled to a fair and reasonable profit for Work performed and reasonable expenses directly attributable to termination of the Contract. In no event shall the Contractor be entitled to **(1)** Contractor's Fee on Work not performed or **(2)** compensation in excess of the total Contract Sum.

**11.2.4** If the Contracting Authority terminates the Work under this **Section 11.2**, the termination shall not affect the rights or remedies of the State against the Contractor then existing or which may thereafter accrue.

**11.2.5** Notwithstanding **Section 11.2.3**, if the Contracting Authority terminates the Work under this **Section 11.2**, but there exists an event of the Contractor's default, the Contractor shall be entitled to receive only such amounts as it would be entitled to receive following the occurrence of an event of default as provided in **Section 11.3**.

## 11.3 Termination for Cause

**11.3.1** The Contracting Authority may terminate all or a portion of the Contract if the Contractor commits a material breach of the Contract including but not limited to:

**11.3.1.1** failure to prosecute the Work with the necessary force or in a timely manner;

**11.3.1.2** refusal to remedy Defective Work;

**11.3.1.3** failure to supply enough properly skilled workers or proper materials;

**11.3.1.4** failure to properly make payment to Subcontractors or Consultants;

**11.3.1.5** performance of any services outside of the United States;



**11.3.1.6** permitting its Subcontractors or Consultants to perform any services outside of the United States; or

**11.3.1.7** disregarding laws, ordinances, or rules, regulations, or orders of a public authority with jurisdiction over the Project.

**11.3.2** If the Contracting Authority intends to exercise its termination rights under this **Section 11.3**, the Contracting Authority shall issue not less than 5 days' written notice to the Contractor and the Contractor's Surety in accordance with ORC Section 153.17 ("5-Day Notice").

**11.3.2.1** Notwithstanding any provision of the Contract to the contrary **(1)** the issuance of a 72-Hour Notice under **Section 6.23.1** is not a condition precedent to the Contracting Authority's exercise of its rights under **Section 11.3** and **(2)** the Contracting Authority's decision to not issue a 72-Hour Notice under **Section 6.23.1** will not prejudice the Contracting Authority's rights under **Section 11.3**.

**11.3.3** If the Contractor fails to satisfy the requirements set forth in the 5-Day Notice within 15 days of receipt of the 5-Day Notice, the Contracting Authority may declare the Contractor in default, terminate the Contract, and employ upon the Work the additional force or supply materials or either as appropriate, and remove Defective Work.

**11.3.4** If the Contract is terminated, the Contractor's Surety may perform the Contract. If the Contractor's Surety does not commence performance of the Contract within 10 days of the date of Contract termination, the Contracting Authority may complete the Work by means the Contracting Authority determines appropriate. The Contracting Authority may take possession of and use all materials, facilities, and equipment at the Site or stored off-site, for which the State has paid.

**11.3.5** If the Contract is terminated, the Contractor shall not be entitled to further payment. If the unpaid balance of the Contract Sum is exceeded by the costs of finishing the Work, including without limitation the fees and charges of engineers, architects, attorneys, and other professionals and court costs, and other damages incurred by the Owner and not expressly waived, the Contractor or Surety shall immediately pay the amount of the insufficiency to the Owner. This obligation for payment shall survive termination of the Contract.

**11.3.6** If the Contractor's Surety performs the Work, the provisions of the Contract Documents govern the Surety's performance, with the Surety in place of the Contractor in all provisions including, but not limited to, provisions for payment for the Work, and provisions of the right of the Contracting Authority to complete the Work.

**11.3.7** If the Contracting Authority terminates the Contract under this **Section 11.3**, the termination shall not affect any rights or remedies of the State against the Contractor then existing or which may thereafter accrue. The Contracting Authority's retention or payment of funds due the Contractor shall not release the Contractor or the Contractor's Surety from liability for performance of the Work in accordance with the requirements of the Contract Documents.

**11.3.8** If the Contracting Authority is adjudged to have improperly terminated the Contract under this **Section 11.3**, the termination will be deemed to have been a termination under **Section 11.2**.

## **11.4 Contractor Insolvency**

### **11.4.1 Bankruptcy of Contractor.**

**11.4.1.1** If the Contractor files a voluntary petition in bankruptcy or has an involuntary petition in bankruptcy filed against it, the Contractor, the Contractor as the debtor-in-possession, or the trustee of the Contractor's bankruptcy estate shall file a motion to assume or reject the Contract under Bankruptcy Code §365, 11 U.S.C. §365, within 20 days after the filing of the voluntary petition or involuntary petition and shall diligently prosecute that motion to conclusion so as to obtain an order granting or denying that motion within 45 days after the filing of the voluntary or involuntary petition. The failure to file and prosecute that motion within the time limits provided by this **Section 11.4** shall constitute a material breach of the Contract as time is of the essence with respect to Contractor's performance of all terms of this Contract. The Contractor agrees to the granting of relief from the automatic stay of the Bankruptcy Code, 11 U.S.C. §362(a), to permit the Contracting Authority to terminate the Contract for cause in such instance and issue and serve all notices necessary to terminate the Contract or arising out of the termination of the Contract and to take any and all other action necessary to terminate the Contract.

### **11.4.2 Receivership or Assignment for the Benefit of Creditors.**

**11.4.2.1** If the Contractor makes a general assignment for the benefit of creditors or if a receiver is appointed for all or a substantial part of the Contractor's business or property, the Contracting Authority shall serve written notice on the Contractor and Contractor's Surety stating that any failure of the Contractor to provide adequate assurance of continued performance shall be considered a rejection of the Contract, which shall result in termination of the Contract for cause. Such termination of the Contract need not be evidenced by an order of any court.

**ARTICLE 12 - GENERAL PROVISIONS****12.1 Contractor's Documents and Contract Documents****12.1.1 Ownership.**

**12.1.1.1** The Owner alone owns the Contractor's Documents and the Contract Documents and every right, title, and interest therein.

- .1** The Contractor must execute and deliver and cause its employees and agents and all Subcontractors and Consultants to execute and deliver, to the Owner any transfers, assignments, documents, or other instruments (if any) necessary to vest in the Owner complete right, title, interest in and ownership of the Contractor's Documents and the Contract Documents.

**12.1.1.2** The Contractor may retain copies, including reproducible copies, of the Contractor's Documents and the Contract Documents for information, reference, and performance of the Work.

**12.1.1.3** The submission or distribution of the Contractor's Documents or the Contract Documents to meet official regulatory requirements or for similar purposes in connection with the Project is not a waiver of the Owner's reserved rights in the Contractor's Documents and the Contract Documents. Any unauthorized use of the Contractor's Documents or the Contract Documents shall be at the sole risk of the entity making the unauthorized use.

**12.1.1.4** The Contractor shall provide Electronic Files (in native format) to Separate Consultants and Separate Contractors for their use in connection with the Project. The Contractor shall provide the Electronic Files **(1)** at no additional cost to the Separate Consultants, Separate Contractors, and Owner and **(2)** without requiring the Separate Consultants, Separate Contractors, or Owner to agree to any terms or conditions concerning the provision, receipt, or use of the Electronic Files that differ in any material respect from the Contract.

**12.1.2 Intent.**

**12.1.2.1** The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor.

**12.1.2.2** The Contract Documents are complementary, and what is required by one is binding as if required by all.

**12.1.2.3** The Contractor shall provide all labor and materials necessary for the entire completion of the Work described in the Contract Documents and reasonably inferable to produce the intended results.

**12.1.2.4** The Drawings govern dimensions, details, and locations of the Work. The Specifications govern quality of materials and workmanship.

**12.1.2.5** The organization of the Specifications in divisions, sections, and articles, and the arrangement of Drawings shall not restrict the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

**12.1.2.6** In the event of inconsistency or conflict within the Contract Documents, the Contractor shall provide the better quality or greater quantity of Work, and comply with the stricter requirement.

**12.1.2.7** Unless otherwise defined in the Contract Documents, words that have well-known technical or construction industry meanings are used in accordance with those recognized meanings.

**12.1.2.8** The Sections of Division 01 - "General Requirements" govern the performance of the Work of all Sections of the Specifications.

**12.1.3 Use of Electronic Files.**

**12.1.3.1** The Owner, Contracting Authority, A/E, and Contractor reasonably expect that they will provide Electronic Files to each other to facilitate the design and construction of the Project consistent with current practices and customs in the construction industry.

**12.1.3.2** The Owner, Contracting Authority, A/E, and Contractor acknowledge that the use of Electronic Files involves risks not generally associated with the use of paper documents. Those risks include, for example and without limitation, alteration (inadvertent or intentional) and deterioration, both of which may not be readily apparent through casual observation.

**12.1.3.3** The Owner, Contracting Authority, A/E, and Contractor do not warrant to each other that any Electronic File they provide **(1)** was not altered through transmission; **(2)** is compatible with the recipient's computer system or software; **(3)** will not be altered through degradation of the recipient's storage media; or **(4)** is suitable for conversion/translation to and subsequent use in a system or format other than the Electronic File's original system or format.

**12.1.3.4** Before relying on any Electronic File it receives, the recipient is responsible for verifying that the Electronic File was not altered through transmission, degradation of the recipient's own storage media, or other causes.

**12.1.3.5** If the recipient of an Electronic File converts/translates the Electronic File from its original system or format to an alternate system or format, the recipient assumes the risk that the conversion/translation created errors in the converted/translated file.

**12.1.3.6** The Owner, Contracting Authority, A/E, and Contractor shall each maintain and operate its own computer systems and storage media in a commercially reasonable way and take reasonable steps to prevent errors in and deterioration of the Electronic Files it creates, provides, and receives.

**12.1.3.7** In the event of a discrepancy between information contained in a paper version of a document and the Electronic File of that document, the paper version will govern.

**12.1.3.8** This **Section 12.1.3** does not relieve the Contractor of its responsibility for the preparation, completeness, or accuracy of the Contractor's Documents.

## 12.2 Public Relations

**12.2.1** Publicity prior to completion of the Project. Prior to completion of the Project, public relations or publicity about the Project shall be solely within the control, and with the consent of, the Owner.

**12.2.2** Publicity after completion of the Project. After completion of the Project, the Contractor may exercise reasonable public relations and marketing efforts related to the Project, provided the Contractor properly identifies the Owner and Contracting Authority, and their participation in the Project.

**12.2.3** Professional Photography. If the Contractor commissions photography of the completed Project, the Contractor shall include in its photography agreements a release for unrestricted and unlimited use of photographs by the Owner and Contracting Authority, and shall provide the Owner and Contracting Authority with a reasonable quantity of photographs for use in the Owner's and the Contracting Authority's marketing and awareness activities, including, but not limited to, profiles of the Project on their respective websites.

**12.2.4** Craft Awards and Other Recognition. If the Contractor submits the Project for craft awards or other similar venues for recognition of the Project, the Contractor shall properly identify the Owner and Contracting Authority, and their participation in the Project. In addition, if the Project receives any craft award or other recognition, the Contractor shall provide duplicate copies of the award plaque or other memento of the award to the Owner and Contracting Authority.

## 12.3 Application and Governing Law

**12.3.1** The Contract and the rights of the parties thereunder shall be governed by the laws of the state of Ohio and only Ohio courts shall have jurisdiction over any action or proceeding concerning the Contract and/or performance thereunder. The Contractor irrevocably consents to such jurisdiction.

**12.3.2** The parties to the Contract shall comply with Applicable Law.

**12.3.3** Other rights and responsibilities of the Contractor, A/E, Contracting Authority, and Owner are set forth throughout the Contract Documents and included under different titles, articles, and paragraphs for convenience.

## 12.4 Conditions of the Contract

**12.4.1** These General Conditions govern, take precedence over, and shall not be superseded or amended by Drawings and Specifications, unless so provided in Supplementary Conditions prepared by the Contracting Authority and approved by the Ohio Facilities Construction Commission.

## 12.5 Notice of Commencement.

**12.5.1** The Contracting Authority shall prepare a Notice of Commencement and make it available as required under ORC Section 1311.252.

**12.5.2** Upon request, the Contracting Authority or the Contractor shall furnish the Notice of Commencement to Subcontractors or any other member of the public.

## 12.6 Written Notice

**12.6.1** Notice under the Contract Documents shall be validly given if:

**12.6.1.1** delivered personally to a member of the organization for whom the notice is intended;

**12.6.1.2** delivered, or sent by registered or certified mail, to the last known business address of the organization; or

**12.6.1.3** sent by facsimile, email, or web-based project management software, provided the original, signed document is delivered within 3 business days after the date of the electronic transmission.

**12.6.2** When the Owner, Contracting Authority, A/E, or Contractor gives notice to one of the other 3, it shall also simultaneously send a copy of that notice to the others.

**12.6.3** A copy of all notices, certificates, requests, or other communications to the Contracting Authority shall be sent to the Project Manager.

**12.6.4** In the event of an emergency involving the Project, including, but not limited to, a fatality, serious injury, fire, collapse, flood, utility, or power loss to occupied facilities, explosion, or environmental damage, the Contractor shall immediately notify the A/E, Contracting Authority, and Owner by telephone.

**12.6.5** The Contracting Authority, Owner, A/E, or Contractor may, by written notice given hereunder, designate addresses, telephone numbers, email addresses, or facsimile numbers to which notices, certificates, requests, or communications shall be sent.

## 12.7 Taxes

**12.7.1** Only those materials that ultimately become a part of the completed structure or improvement that constitutes the Project shall be exempt from state sales tax and state use tax.

**12.7.2** The purchase, lease, or rental of material, equipment, parts, or expendable items as concrete form lumber, tools, oils, greases, and fuels, which are used in connection with the Work, are subject to the application of state sales tax and state use tax.

## 12.8 Computing Time

**12.8.1** When the Contract Documents refer to a period of time by a number of days, the period shall be computed to exclude the first and include the last day of the period. If the last day of the period falls on a Saturday, Sunday, or a legal holiday, that day shall be omitted from the computation and the period shall end on the next succeeding day that is not a Saturday, Sunday, or legal holiday.

**12.8.2** Except as excluded under **Section 12.8.1**, the Contract Times and all other periods referred to in the Contract Documents includes Saturdays, Sundays, and all days defined as legal holidays by **Section 12.8.4**.

**12.8.3** The standard workdays for State projects are Monday through Friday, excluding legal holidays.

**12.8.4** Legal holidays are as follows:

**12.8.4.1** New Year's Day – First Day in January;

**12.8.4.2** Martin Luther King Jr. Day – Third Monday in January;

**12.8.4.3** Washington-Lincoln (President's) Day – Third Monday in February;

**12.8.4.4** Memorial Day – Last Monday in May;

**12.8.4.5** Independence Day – Fourth day of July;

**12.8.4.6** Labor Day – First Monday in September;

**12.8.4.7** Columbus Day – Second Monday in October;

**12.8.4.8** Veterans' Day – Eleventh Day of November;

**12.8.4.9** Thanksgiving Day – Fourth Thursday of November; and

**12.8.4.10** Christmas Day – Twenty-fifth day of December.

**12.8.5** If a legal holiday falls on a Saturday, it is observed on the preceding Friday. If a legal holiday falls on a Sunday, it is observed on the following Monday.

## 12.9 Time of the Essence

**12.9.1** Time limits stated in the Contract Documents are of the essence of the Contract and all obligations under the Contract. By signing the Agreement, the Contractor acknowledges that the Contract Times are reasonable, taking into consideration the usual weather and other conditions prevailing in the locality of the Project. By signing the Construction Schedule, the Contractor acknowledges that the specified Milestone dates are reasonable, taking into consideration the usual weather and other conditions prevailing in the locality of the Project.

**12.9.1.1** The Notice to Proceed establishes the date for commencement of the Work.

**12.9.1.2** The Contractor acknowledges that the Owner has entered into, or may enter into, agreements for use of all or part of the premises where the Work is to be completed based upon the Contractor achieving Contract Completion within the associated Contract Time.

**12.9.1.3** The Contractor shall perform the Work in a reasonable, efficient, and economical sequence, and in the order and time as provided in the Construction Progress Schedule.

**12.9.1.4** The Contractor acknowledges that it may be subject to interference, disruption, hindrance, or delay in the progress of the Work from any cause. The sole remedy for such interference, disruption, hindrance, or delay shall be an extension of the Contract Times under **Article 8**, unless otherwise required by ORC Section 4113.62.

## 12.10 Successors and Assigns

**12.10.1** The Contracting Authority and Contractor each bind themselves, their successors, assigns, and legal representatives, to the other party to this Contract and to the successors, assigns, and legal representatives of the other party with respect to all terms of this Contract.

**12.10.2** The Contracting Authority and Contractor each acknowledge that the Owner is an intended third-party beneficiary of this Contract.

**12.10.3** The Contractor shall not assign, or transfer any right, title, or interest in this Contract without the Contracting Authority's prior written consent.

## 12.11 Extent of Contract

**12.11.1** Entire Contract. The Contract Documents represent the entire and integrated agreement between the Contracting Authority and Contractor and supersede all prior negotiations, representations, or agreements, either written or oral.

**12.11.2** Multiple Counterparts. This Contract may be executed in any number of counterparts, each of which shall be regarded as an original and all of which shall constitute but one and the same instrument.

**12.11.3** Captions. The captions and headings in this Contract are for convenience only and in no way define, limit, or describe the scope or intent of any provisions or sections hereof.

**12.11.4** Precedence. If there are any inconsistencies between the provisions of the Contract Documents and the provisions of the Contract, the provisions of this Contract shall prevail.

## 12.12 Severability

**12.12.1** If any term or provision of this Contract or the application thereof to any Person or circumstance, is finally determined to be invalid or unenforceable by a court of competent jurisdiction, the remainder of this Contract or the application of such term or provision to other Persons or circumstances, shall not be affected thereby, and each term and provision of this Contract shall be valid and enforced to the fullest extent permitted by Applicable Law.

## 12.13 Electronic and Facsimile Signatures

**12.13.1** Any party hereto may deliver a copy of its counterpart signature page to this Contract via electronic signature software, fax, e-mail, or web-based project management software. Each party hereto shall be entitled to rely upon an electronic, scanned, or facsimile signature of any other party delivered in such a manner as if such signature were an original.

## 12.14 No Third-Party Interest

**12.14.1** Except as expressly provided under **Sections 6.2.3** through **6.2.5** and **Section 12.10.2, (1)** no person or entity, other than the Contracting Authority and Contractor, will have any right or interest under the Contract, and **(2)** the Contract does not create a contractual relationship of any kind between any people or entities other than the Contracting Authority and Contractor.

## 12.15 Ohio Retirement System

**12.15.1** All individuals employed by the Contractor that provide personal services to the Contracting Authority or Owner are not public employees for the purposes of ORC Chapter 145, as amended.

**12.15.2** If the Contractor is a PERS retirant, as defined by ORC Section 145.38, the Contractor shall notify the Contracting Authority of such status in writing prior to commencement of Work. The Contracting Authority, Owner, or State is not responsible for changes to the Contractor's retirement benefits resulting from entering into this Contract.

## 12.16 No Waiver

**12.16.1** The failure of the Contracting Authority or Contractor to insist in any one or more instances upon the strict performance of any one or more of the provisions of the Contract or to exercise any rights under the Contract or provided by law will not be construed as a waiver or relinquishment of that provision or right or of the right to subsequently demand strict performance or exercise the right and the rights will continue unchanged and remain in full force and effect.

## 12.17 Rights and Remedies

**12.17.1** The duties, obligations, rights, and remedies under the Contract are in addition to and not a limitation of the duties, obligations, rights, and remedies otherwise imposed by or available under Applicable Law.

## 12.18 Survival of Obligations

**12.18.1** All representations, indemnity obligations, warranties, guarantees, and necessarily continuing obligations under the Contract, will survive final payment, completion and acceptance of the Work, and termination or completion of the Contract.

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**END OF DOCUMENT**





# Document 00 73 00 - Supplementary Conditions (ODOT - GC)

## State of Ohio Standard Requirements for Public Facility Construction

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### Certifications

These Supplementary Conditions amend and supplement the General Conditions and other provisions of the Contract Documents as indicated below. All provisions not amended remain in full force and effect. The terms in these Supplementary Conditions defined in the Contracting Definitions or the General Conditions shall have the meanings assigned to them in those documents.

These Supplementary Conditions are authorized, by the Ohio Facilities Construction Commission, for use on projects constructed by [the Ohio Facilities Construction Commission](#) for [the Ohio Department of Transportation](#).

### Contracting Authority

[Ohio Facilities Construction Commission](#)  
30 W Spring Street  
Columbus, Ohio 43215  
614.466.6290  
<http://ofcc.ohio.go>

## MODIFICATIONS TO GENERAL CONDITIONS

*At the end of Section 5.2.4.1, delete “if required under Applicable Law” and add the following:*

The Contractor shall file a co-permittee form. Information about the form can be found at [www.epa.state.ohio.us/dsw/stormform.html](http://www.epa.state.ohio.us/dsw/stormform.html). The Contractor shall furnish a copy of the submitted form to the Contracting Authority no later than the Pre-Construction Meeting.

*Delete Sections 6.2.9, 6.2.10, 6.2.11, and 6.2.12 in their entirety.*

*Delete Section 6.5 Construction Progress Schedule and its subordinate sections in their entirety.*

*In Section 6.2.16 after “parking lots,” insert “job trailers.”*

*In Section 6.6.2.1 replace “A/E” with “Contracting Authority”.*

*In Section 6.6.3 after “and Contractor”, insert “within 3 business days.”*

*In Section 6.7.1 delete the following*

*“The Contractor shall prepare the Coordination Drawings.....during the coordination meetings.”*

*After Section 6.7.1 insert the following:*

1. The Contractor shall prepare the Coordination Drawings with Computer-Aided Design (“CAD”) or Building Information Modeling (“BIM”) software acceptable to the Contracting Authority. The Coordination Drawing process, includes the following:

*Sections 6.7.1.1, 6.7.1.2, and 6.7.1.3 are renumbered to be paragraphs 6.7.2.4, 6.7.2.5, and 6.7.2.6.*

*After Section 6.7.2 insert the following:*

**6.7.2.1** The Subcontractor responsible for the HVAC system shall prepare the preliminary coordination drawings for each coordination area, showing all ductwork, equipment, and HVAC pipe in plan and elevation, and provide to all Coordination Participants for review and comment.

1. Each Coordination Participant marks the drawings illustrating the location of their work, i.e. plumbing, fire suppression, electrical, and returns its drawings to the Subcontractor responsible for the HVAC systems.

**6.7.2.3** The Subcontractor responsible for the HVAC system will incorporate each participant's work and meets with all the participants to coordinate and agree on the final details. The Subcontractor responsible for the HVAC system will prepare the final Coordination Drawings that all the participants approve and utilize to sequence and install the work.

*In Section 6.14.1.2.2 after "adequate" insert "secure".*

*Insert Sections 6.25.3.3 as follows:*

## **6.25 Project Document Maintenance and Submittal**

### **6.25.3 Record Documents**

**6.25.3.3** The A/E shall submit the Record Documents to the Contracting Authority no later than 30 days from issuance of the Certificate of Contract Completion.

*At the end of Section 6.27.1.1 add the following:*

A deferred item is defined as work that is not complete or contractually non-compliant due to circumstances outside of the Contractor's responsibilities. The Contracting Authority, under advisement of the A/E, accepts or rejects the deferred items, and states the reasons therefore.

*In Section 6.27.1.1.1 delete "and certify that .....the Contractor's Punch List.", and add the following sentence:*

Incomplete items listed on the Contractor's Punch List are accepted deferred items still to be executed.

*Sections 6.27.1.2 and 6.27.1.3 are renumbered 6.27.1.3 and 6.27.1.4 respectively.*

*After Section 6.27.1.1 insert the following new section:*

**.2** The Contractor certifies to its knowledge; the Contractor's Punch List is accurate and complete by signing the Contractor's Punch List.

*In Section 6.27.2.1.2 after "and include a list of" delete "Defective, incomplete, or".*

*In Section 6.27.2.1.2 after "Punch List shall include" replace the text with the following:*

**(1)** allowable minor unacceptable work that can be remedied without affecting the Occupant's use of the improvements, **(2)** the accepted deferred items on the Contractor's Punch List that are not yet completed or corrected as of the date of the Substantial Completion inspection, and **(3)** comments from the Contracting Authority and owner.

*Replace Section 6.27.2.1.5 with the following*

**.5** If the A/E accepts the request and subsequently determines that the Work is not Substantially Complete, the A/E will not be compensated for expenses related to excessive punch list activities. It is the A/E's

responsibility to be knowledgeable of the status of the work including non-compliant work and incomplete work at all times during construction and to keep the Owner and Contracting Authority informed of same in a timely manner.

*In Section 6.27.3.1, replace “Within 30 Days” with “**Within 60 days**”.*

*Replace Section 6.29- with the following:*

#### **6.29 Demonstration and Training, Operating Appurtenances**

**6.29.1** The Contractor, as a condition precedent to execution of the Certificate of Substantial Completion shall perform demonstration and training of the Owner’s maintenance personnel as specified in the Contract Documents.

**6.29.2** The Contractor, as a condition precedent to execution of the Certificate of Substantial Completion shall organize and submit operating appurtenances and loose items related to operation and maintenance of the completed Project to the Owner, including, but not limited to:

**6.29.2.1** keys to door and window hardware, panels, and other devices not directly provided to the Owner from the manufacturer; and

**6.29.2.2** operating handles, levers, cranks, specialized wrenches or drivers remote controls, and similar items; and

**6.29.2.3** extra materials (e.g., attic stock).

*In Section 7.5.1 after “by written order” insert “**approved by the Contracting Authority, and**”.*

*In Section 7.6.2 replace “10 days” with “**24 hours**”.*

*Replace Section 9.8.2.8 with the following:*

**9.8.2.8** failure to maintain schedules in a contract compliant status,

**END OF DOCUMENT**



# Document 00 73 43 - Wage Rate Requirements

## State of Ohio Standard Requirements for Public Facility Construction

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### PREVAILING WAGE RATES

#### 1.1 Payment of Prevailing Wage Rates

1.1.1 The Contractor shall pay the prevailing wage rates of the Project locality, as issued by the Ohio Department of Commerce, Wage and Hour Bureau to laborers and mechanics performing Work on the Project.

1.1.2 The Contractor shall comply with the provisions, duties, obligations, and is subject to the remedies and penalties of ORC Chapter 4115.

1.1.3 If the Contractor or its Subcontractors fail to comply with ORC Chapter 4115, the Contracting Authority may withhold payment pursuant to **Section 9.8.2.5** of the **General Conditions**. The Contractor is liable for violations committed by the Contractor or its Subcontractors to the extent provided in ORC Chapter 4115.

1.1.4 The Contractor shall submit all payroll reports in compliance with the requirements of **Section 1.2** for all employees of the Contractor and of the Contractor's Subcontractors.

1.1.5 By executing a Contract, the Contractor certifies that it based its Bid upon the prevailing rates of wages as ascertained by the Ohio Department of Commerce, Wage and Hour Bureau for the Project as provided in ORC Sections 4115.03 through 4115.14, which are inserted at the end of this Document.

#### 1.2 Prevailing Wage Rate Revisions

1.2.1 The Contracting Authority shall, within 7 business days after receipt of a notice of a change in the prevailing wage rates, notify the Contractor of the change. The prevailing wage rates are available at the Ohio Department of Commerce's web site: <http://com.state.oh.us/>.

1.2.2 The Contractor shall pay any revised wage rates issued during the term of the Contract.

#### 1.3 Payroll Schedule

1.3.1 Within 10 days of the date of the Notice to Proceed, the Contractor shall provide the Contracting Authority's Prevailing Wage Coordinator a schedule of dates during the term of the Contract on which wages shall be paid to employees for the Project.

#### 1.4 Payroll Reports

1.4.1 The Contractor shall submit payroll reports with each Contractor Payment Request, which reports shall be certified by the Contractor that the payroll is correct and complete, and that the wage rates shown are not less than those required by the Contract. The Contractor is responsible for submitting all payroll reports of its Subcontractors.

1.4.1.1 Each payroll report shall indicate the period covered and include a list containing the name, address, and last four digits of the social security number of each employee of the Contractor and its Subcontractors paid for the Work.

1.4.1.2 Each payroll report shall list the number of hours each employee worked each day on the Project during the reporting period, the total hours each week on the Project, the employee's hourly rate of pay, job classification, hourly rate of fringe benefits, and all deductions from wages and net pay.


1.4.1.3 Each payroll report shall list each fringe benefit and state if it is paid as cash to the employee or to a named plan.

1.4.1.4 The Contractor and its Subcontractors shall submit apprenticeship agreements for all apprentices utilized on the Project with the first payroll report from the Contractor or its Subcontractor that includes apprentices.

**END OF DOCUMENT**



## Prevailing Wage Determination Cover Letter

**County:** PREBLE  

**Determination Date:** 12/17/2021

**Expiration Date:** 03/17/2022

THE FOLLOWING PAGES ARE PREVAILING RATES OF WAGES ON PUBLIC IMPROVEMENTS FAIRLY ESTIMATED TO BE MORE THAN THE AMOUNT IN O.R.C. SEC. 4115.03 (b) (1) or (2), AS APPLICABLE.

Section 4115.05 provides, in part: "Where contracts are not awarded or construction undertaken within ninety days from the date of the establishment of the prevailing wages, there shall be a redetermination of the prevailing rate of wages before the contract is awarded." The expiration date of this wage schedule is listed above for your convenience only. This wage determination is not intended as a blanket determination to be used for all projects during this period without prior approval of this Department.

Section 4115.04, Ohio Revised Code provides, in part: "Such schedule of wages shall be attached to and made a part of the specifications for the work, and shall be printed on the bidding blanks where the work is done by contract..."

The contract between the letting authority and the successful bidder shall contain a statement requiring that mechanics and laborers be paid a prevailing rate of wage as required in Section 4115.06, Ohio Revised Code.

The contractor or subcontractor is required to file with the contracting public authority upon completion of the project and prior to final payment therefore an affidavit stating that he has fully complied with Chapter 4115 of the Ohio Revised Code.

The wage rates contained in this schedule are the "Prevailing Wages" as defined by Section 4115.03, Ohio Revised Code (the basic hourly rates plus certain fringe benefits). These rates and fringes shall be a minimum to be paid under a contract regulated by Chapter 4115 of the Ohio Revised Code by contractors and subcontractors. The prevailing wage rates contained in this schedule include the effective dates and wage rates currently on file. In cases where future effective dates are not included in this schedule, modifications to the wage schedule will be furnished to the Prevailing Wage Coordinator appointed by the public authority as soon as prevailing wage rates increases are received by this office.

"There shall be posted in a prominent and accessible place on the site of work a legible statement of the Schedule of Wage Rates specified in the contract to the various classifications of laborers, workmen, and mechanics employed, said statement to remain posted during the life of such contract." Section 4115.07, Ohio Revised Code.

Apprentices will be permitted to work only under a bona fide apprenticeship program if such program exists and if such program is registered with the Ohio Apprenticeship Council.

Section 4115.071 provides that no later than ten days before the first payment of wages is due to any employee of any contractor or subcontractor working on a contract regulated by Chapter 4115, Ohio Revised Code, the contracting public authority shall appoint one of his own employees to act as the prevailing wage coordinator for said contract. The duties of the prevailing wage coordinator are outlined in Section 4115.071 of the Ohio Revised Code.

Section 4115.05 provides for an escalator in the prevailing wage rate. Each time a new rate is established, that rate is required to be paid on all ongoing public improvement projects.

A further requirement of Section 4115.05 of the Ohio Revised Code is: "On the occasion of the first pay date under a contract, the contractor shall furnish each employee not covered by a collective bargaining agreement or understanding between employers and bona fide organizations of Labor with individual written notification of the job classification to which the employee is assigned, the prevailing wage determined to be applicable to that classification, separated into the hourly rate of pay and the fringe payments, and the identity of the prevailing wage Coordinator appointed by the public authority. The contractor or subcontractor shall furnish the same notification to each affected employee every time the job classification of the employee is changed."

Work performed in connection with the installation of modular furniture may be subject to prevailing wage.

**THIS PACKET IS NOT TO BE SEPARATED BUT IS TO REMAIN COMPLETE AS IT IS SUBMITTED TO YOU. (Reference guidelines and forms are included in this packet to be helpful in the compliance of the Prevailing Wage law.)**  
wh1500



## STATE OF OHIO REQUEST FOR PREVAILING WAGE RATES

**Important:** If you wish to retain a copy of this form for your records, please print it prior to clicking on the "Submit" button. When you click the "Submit" button, a prompt should appear which will allow you to obtain the necessary wage rates by clicking on the "view wage rates" button. Submitting this form notifies the Bureau of Labor and Worker Safety of your project. Wage rates will not be sent to you by mail as a result of the submission, rather you should obtain them by clicking on the "view wage rates" button.

### Public Authority Information

<b>Owner/Public Authority Name:</b>	State of Ohio	<b>Date: 12/17/2021</b> This form must be filled out completely & correctly for us to process your request. Forms not completed correctly will be returned to the sender.
<b>Department Division or Agency:</b>	Ohio Facilities Construction Commission	
<b>Street Address:</b>	30 West Sprint Street, 4th Floor	ODOC Date Stamp
<b>Address 2:</b>		
<b>City, OH</b>	Columbus, OH	
<b>ZIP:</b>	43215	
<b>Email:</b>	moenique.morris@ofcc.ohio. It is required that you list your e-mail address here.	
<b>County of Public Authority:</b>	FRANKLIN <input type="checkbox"/>	
<b>P.A. Phone:</b>	614-387-5403	

### Project Information

<b>Project Name:</b>	Eaton Outpost	ODOC Date Stamp (Bld Tab)
<b>Site Address:</b>	5656 US Rt. 127	
<b>City, OH</b>	Eaton, Ohio	
<b>ZIP:</b>	4520	
<b>County of Project:</b>	PREBLE <input type="checkbox"/>	
<b>Prevailing Wage Coordinator Name</b>	Moenique Morris	
<b>Address:</b>	30 West Sprint Street, 4th Fl	
<b>City,</b>	Columbus	
<b>ZIP:</b>	43215	
<b>Phone:</b>	614-387-5403	
<b>Issuing Authority of Bonds:</b>	State of Ohio	
<b>Estimated Total Overall Project Cost:</b>	\$2,300,000	
<b>Type of Financing:</b>	State Funds	
<b>Type of Construction:</b>	<input checked="" type="radio"/> New Construction <input type="radio"/> Old Construction	
<b>This Project is</b>	<input type="radio"/> Residential <input checked="" type="radio"/> Commercial	

<b>Expected Date of Contract Award:</b>	1/21/2022 <b>example 05/31/98</b>
<b>Projected Completion Date:</b>	12/2022 <b>example 05/31/98</b>
<b>Project Comments:</b>	DOT - 200023  (optional)

**Important:** If you wish to retain a copy of this form for your records, please print it prior to clicking on the "Submit" button. When you click the "Submit" button, a prompt should appear which will allow you to obtain the necessary wage rates by clicking on the "view wage rates" button. Submitting this form notifies the Bureau of Labor and Worker Safety of your project. Wage rates will not be sent to you by mail as a result of the submission, rather you should obtain them by clicking on the "view wage rates" button.

Please contact our [Webmaster](#) with questions or comments.

LAW 1002



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# Ohio Department of Commerce

## Bureau of Wage & Hour Administration

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**Classification = All, County = PREBLE, Union = All**

County	Classification	Effective	Posted	Union
<a href="#">PREBLE</a>	<a href="#">Asbestos Worker</a>	<a href="#">8/23/2018</a>	<a href="#">8/23/2018</a>	<a href="#">Asbestos Local 207 OH</a>
<a href="#">PREBLE</a>	<a href="#">Asbestos Worker</a>	<a href="#">12/17/2021</a>	<a href="#">12/17/2021</a>	<a href="#">Asbestos Local 50 Zone 2</a>
<a href="#">PREBLE</a>	<a href="#">Boilermaker</a>	<a href="#">10/1/2013</a>	<a href="#">9/25/2013</a>	<a href="#">Boilermaker Local 105</a>
<a href="#">PREBLE</a>	<a href="#">Carpenter</a>	<a href="#">10/6/2021</a>	<a href="#">10/6/2021</a>	<a href="#">Carpenter Floorlayer SW District G</a>
<a href="#">PREBLE</a>	<a href="#">Carpenter</a>	<a href="#">9/22/2021</a>	<a href="#">9/22/2021</a>	<a href="#">Carpenter Millwright Local 1090 SW Zone II</a>
<a href="#">PREBLE</a>	<a href="#">Carpenter</a>	<a href="#">3/5/2014</a>	<a href="#">3/5/2014</a>	<a href="#">Carpenter NE District Industrial Dock &amp; Door</a>
<a href="#">PREBLE</a>	<a href="#">Carpenter</a>	<a href="#">7/14/2021</a>	<a href="#">7/14/2021</a>	<a href="#">Carpenter &amp; Pile Driver SW Zone 1</a>
<a href="#">PREBLE</a>	<a href="#">Carpenter</a>	<a href="#">6/17/2021</a>	<a href="#">6/17/2021</a>	<a href="#">Carpenter &amp; Pile Driver SW District HevHwy</a>
<a href="#">PREBLE</a>	<a href="#">Bricklayer</a>	<a href="#">6/1/2021</a>	<a href="#">5/26/2021</a>	<a href="#">Cement Mason Bricklayer Local 97 HevHwy A</a>
<a href="#">PREBLE</a>	<a href="#">Bricklayer</a>	<a href="#">6/1/2021</a>	<a href="#">5/26/2021</a>	<a href="#">Cement Mason Bricklayer Local 97 HevHwy B</a>
<a href="#">PREBLE</a>	<a href="#">Cement</a>	<a href="#">6/24/2021</a>	<a href="#">6/24/2021</a>	<a href="#">Cement Mason Local 132 (Dayton)</a>
<a href="#">PREBLE</a>	<a href="#">Cement Mason</a>	<a href="#">5/1/2021</a>	<a href="#">4/23/2021</a>	<a href="#">Cement Mason Statewide HevHwy Exhibit A District III</a>
<a href="#">PREBLE</a>	<a href="#">Cement Mason</a>	<a href="#">5/1/2021</a>	<a href="#">4/23/2021</a>	<a href="#">Cement Mason Statewide HevHwy Exhibit B District III</a>
<a href="#">PREBLE</a>	<a href="#">Lineman</a>	<a href="#">3/16/2021</a>	<a href="#">3/16/2021</a>	<a href="#">Electrical Local 71 DOT Traffic Signal Highway Lighting American Line Builders</a>
<a href="#">PREBLE</a>	<a href="#">Lineman</a>	<a href="#">3/16/2021</a>	<a href="#">3/16/2021</a>	<a href="#">Electrical Local 71 High Tension Pipe Type Cable</a>
<a href="#">PREBLE</a>	<a href="#">Lineman</a>	<a href="#">3/16/2021</a>	<a href="#">3/16/2021</a>	<a href="#">Electrical Local 71 Outside Utility Power</a>
<a href="#">PREBLE</a>	<a href="#">Voice Data Video</a>	<a href="#">10/18/2017</a>	<a href="#">10/18/2017</a>	<a href="#">Electrical Local 71 Voice Data Video Outside</a>
<a href="#">PREBLE</a>	<a href="#">Electrical</a>	<a href="#">11/29/2021</a>	<a href="#">11/24/2021</a>	<a href="#">Electrical Local 82 Inside</a>
<a href="#">PREBLE</a>	<a href="#">Electrical</a>	<a href="#">1/1/2021</a>	<a href="#">12/24/2020</a>	<a href="#">Electrical Local 82 Inside Lt Commercial South West</a>
<a href="#">PREBLE</a>	<a href="#">Electrical</a>	<a href="#">11/30/2020</a>	<a href="#">11/25/2020</a>	<a href="#">Electrical Local 82 Lightning Rod</a>
<a href="#">PREBLE</a>	<a href="#">Voice Data Video</a>	<a href="#">11/29/2021</a>	<a href="#">11/24/2021</a>	<a href="#">Electrical Local 82 Voice Data Video</a>
<a href="#">PREBLE</a>	<a href="#">Elevator</a>	<a href="#">1/5/2021</a>	<a href="#">1/5/2021</a>	<a href="#">Elevator Local 11</a>
<a href="#">PREBLE</a>	<a href="#">Glazier</a>	<a href="#">11/1/2020</a>	<a href="#">10/28/2020</a>	<a href="#">Glazier Local 387</a>
<a href="#">PREBLE</a>	<a href="#">Ironworker</a>	<a href="#">1/27/2021</a>	<a href="#">1/27/2021</a>	<a href="#">Ironworker Local 290</a>
<a href="#">PREBLE</a>	<a href="#">Laborer Group 1</a>	<a href="#">5/1/2021</a>	<a href="#">4/21/2021</a>	<a href="#">Labor HevHwy 3</a>
<a href="#">PREBLE</a>	<a href="#">Laborer</a>	<a href="#">7/22/2021</a>	<a href="#">7/22/2021</a>	<a href="#">Labor Local 1410 Building</a>
<a href="#">PREBLE</a>	<a href="#">Operating Engineer</a>	<a href="#">8/13/2021</a>	<a href="#">8/13/2021</a>	<a href="#">Operating Engineers - Building Local 18 - Zone III</a>
<a href="#">PREBLE</a>	<a href="#">Operating Engineer</a>	<a href="#">8/13/2021</a>	<a href="#">8/13/2021</a>	<a href="#">Operating Engineers - HevHwy Zone II</a>
<a href="#">PREBLE</a>	<a href="#">Drywall Finisher</a>	<a href="#">12/16/2021</a>	<a href="#">12/16/2021</a>	<a href="#">Painter Local 249</a>
<a href="#">PREBLE</a>	<a href="#">Painter</a>	<a href="#">12/16/2021</a>	<a href="#">12/16/2021</a>	<a href="#">Painter Local 249</a>
<a href="#">PREBLE</a>	<a href="#">Painter</a>	<a href="#">12/16/2021</a>	<a href="#">12/16/2021</a>	<a href="#">Painter Local 249 HevHwy</a>
<a href="#">PREBLE</a>	<a href="#">Painter</a>	<a href="#">6/10/2015</a>	<a href="#">6/10/2015</a>	<a href="#">Painter Local 639</a>
<a href="#">PREBLE</a>	<a href="#">Painter</a>	<a href="#">8/3/2016</a>	<a href="#">8/3/2016</a>	<a href="#">Painter Local 639 Zone 2 Sign</a>
<a href="#">PREBLE</a>	<a href="#">Plaster</a>	<a href="#">5/26/2021</a>	<a href="#">5/26/2021</a>	<a href="#">Plasterer Local 132 (Dayton)</a>
<a href="#">PREBLE</a>	<a href="#">Plumber/Pipefitter</a>	<a href="#">6/24/2021</a>	<a href="#">6/24/2021</a>	<a href="#">Plumber Pipefitter Local 162</a>
<a href="#">PREBLE</a>	<a href="#">Roofer</a>	<a href="#">6/9/2021</a>	<a href="#">6/9/2021</a>	<a href="#">Roofer Local 75</a>
<a href="#">PREBLE</a>	<a href="#">Sheet Metal Worker</a>	<a href="#">7/14/2021</a>	<a href="#">7/14/2021</a>	<a href="#">Sheet Metal Local 24 (Dayton)</a>
<a href="#">PREBLE</a>	<a href="#">Sprinkler Fitter</a>	<a href="#">4/1/2021</a>	<a href="#">3/31/2021</a>	<a href="#">Sprinkler Fitter Local 669</a>
<a href="#">PREBLE</a>	<a href="#">Truck Driver</a>	<a href="#">5/21/2021</a>	<a href="#">5/21/2021</a>	<a href="#">Truck Driver Bldg &amp; HevHwy Class 1 Locals 20.40.92.92b.100.175.284.438.377.637.908.957</a>
<a href="#">PREBLE</a>	<a href="#">Truck Driver</a>	<a href="#">5/21/2021</a>	<a href="#">5/21/2021</a>	<a href="#">Truck Driver Bldg &amp; HevHwy Class 2 Locals 20.40.92.92b.100.175.284.438.377.637.908.957</a>
<a href="#">PREBLE</a>	<a href="#">Bricklayer</a>	<a href="#">6/1/2021</a>	<a href="#">5/26/2021</a>	<a href="#">Bricklayer Local 18</a>
<a href="#">PREBLE</a>	<a href="#">Bricklayer</a>	<a href="#">9/1/2020</a>	<a href="#">8/20/2020</a>	<a href="#">Bricklayer Local 18 Tile Finisher</a>
<a href="#">PREBLE</a>	<a href="#">Bricklayer</a>	<a href="#">9/1/2020</a>	<a href="#">8/20/2020</a>	<a href="#">Bricklayer Local 18 Tile Mechanic</a>
<a href="#">PREBLE</a>	<a href="#">Bricklayer</a>	<a href="#">6/1/2021</a>	<a href="#">5/26/2021</a>	<a href="#">Bricklayer Local 22</a>
<a href="#">PREBLE</a>	<a href="#">Bricklayer</a>	<a href="#">8/13/2021</a>	<a href="#">8/13/2021</a>	<a href="#">Bricklayer Local 22 Tile Finisher</a>
<a href="#">PREBLE</a>	<a href="#">Bricklayer</a>	<a href="#">8/13/2021</a>	<a href="#">8/13/2021</a>	<a href="#">Bricklayer Local 22 Tile Mechanics</a>

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## Contacts

**If you would like to reach us, you may contact us at:**

Division of Industrial Compliance & Labor  
Wage and Hour Bureau  
6606 Tussing Road, P.O. Box 4009  
Reynoldsburg, Ohio 43068-9009  
(614) 644-2239  
Fax: (614) 728-8639

Michele Hanly, Interim Chief

or you may E-Mail your query to:

[webmaster@wagehour.com.state.oh.us](mailto:webmaster@wagehour.com.state.oh.us)

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**You must log in before viewing wage rates.**

**Note: If you are experiencing difficulties pulling up the wage rates please leave “select” in the classification, list the “county” you are searching, and leave “select” in the Union section. This will pull up all of the rates for that county and you can select the classification needed.**

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# Prevailing Wage Rate Skilled Crafts

Name of Union: **Asbestos Local 207 OH**

**Change # : LCN01-2018fbLoc207OH**

**Craft : Asbestos Worker Effective Date : 08/23/2018 Last Posted : 08/23/2018**

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
<b>Classification</b>											
Asbestos Abatement	\$25.50	\$7.25	\$6.45	\$0.65	\$0.00	\$0.00	\$0.07	\$0.00	\$0.00	\$39.92	\$52.67
Trainee	\$16.50	\$7.25	\$1.50	\$0.65	\$0.00	\$0.00	\$0.07	\$0.00	\$0.00	\$25.97	\$34.22

**Special Calculation Note :**

**Ratio :**

3 Journeymen to 1 Trainee

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ASHLAND, ASHTABULA\*, ATHENS, AUGLAIZE, BROWN, BUTLER\*, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GEAUGA, GREENE, GUERNSEY, HAMILTON, HARDIN, HARRISON, HIGHLAND, HOCKING, HOLMES, HURON, KNOX, LAKE, LICKING, LOGAN, LORAIN, MADISON, MAHONING, MARION, MEDINA, MIAMI, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PORTAGE, PREBLE, RICHLAND, ROSS, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VINTON, WARREN\*, WAYNE

**Special Jurisdictional Note :** Butler County:( townships of Fairfield,Hanover,Liberty,Milford,Morgan,Oxford,Ripley,Ross,StClair,Union & Wayne.) (Lemon & Madison) Warren County: (townships of: Deerfield, Hamilton, Harlan, Salem, Union & Washington). ( Clear Creek, Franklin, Mossie, Turtle Creek & Wayney). Ashtabula County: (post offices & townships of Ashtabula, Austinburg, Geneva, Harperfield, Jefferson, Plymouth & Saybrook) (townships of Andover, Cherry Valley, Colbrook, Canneaut, Denmark, Dorset, East Orwell, Hartsgrove, Kingville, Lenox, Monroe,Morgan,New Lyme,North Kingsville, Orwell, Pierpoint, Richmond Rock Creek, Rome, Sheffield, Trumbull, Wayne, Williamsfield & Windsor) Erie County:(post offices & townships of Berlin, Berlin Heights,Birmingham,Florence ,Huron, Milan, Shinrock & Vermilion)

**Details :**

Asbestos & lead paint abatement including, but not limited to the removal or encapsulation of asbestos & lead paint, all

work in conjunction with the preparation of the removal of same & all work in conjunction with the clean up after said removal. The removal of all insulation materials, whether they contain asbestos or not, from mechanical systems (pipes, boilers, ducts, flues, breaching, etc.) is recognized as being the exclusive work of the Asbestos Abatement Workers.

On all mechanical systems (pipes, boilers, ducts, flues, breaching, etc.) that are going to be demolished, the removal of all insulating materials whether they contain asbestos or not shall be the exclusive work of the Laborers.

An Abatement Journeyman is anyone who has more than 300 hours in the Asbestos Abatement field.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Asbestos Local 50 Zone 2

**Change # : LCR01-2021sksLoc50**

**Craft : Asbestos Worker Effective Date : 12/17/2021 Last Posted : 12/17/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Asbestos Insulation Mechanic	\$32.08		\$7.70	\$7.85	\$0.50	\$0.00	\$2.90	\$0.05	\$0.00	\$0.00	\$51.08	\$67.12
Firestop Technician	\$32.08		\$7.70	\$7.85	\$0.50	\$0.00	\$2.90	\$0.05	\$0.00	\$0.00	\$51.08	\$67.12
<b>Apprentice Percent</b>												
1st year	57.55	\$18.46	\$7.46	\$0.00	\$0.44	\$0.00	\$0.00	\$0.05	\$0.00	\$0.00	\$26.41	\$35.64
2nd year	69.69	\$22.36	\$7.70	\$0.95	\$0.44	\$0.00	\$0.00	\$0.05	\$0.00	\$0.00	\$31.50	\$42.67
3rd year	81.10	\$26.02	\$7.70	\$2.38	\$0.44	\$0.00	\$0.75	\$0.05	\$0.00	\$0.00	\$37.34	\$50.35
4th year	89.43	\$28.69	\$7.70	\$2.38	\$0.44	\$0.00	\$0.75	\$0.05	\$0.00	\$0.00	\$40.01	\$54.35

**Special Calculation Note :** \*other is labor mgt training fund

**Ratio :**

1 Journeyman to 1 Apprentice  
4 Journeymen to 1 Apprentice thereafter

**Jurisdiction ( \* denotes special jurisdictional note ) :**

CHAMPAIGN, CLARK, DARKE, GREENE, MIAMI, MONTGOMERY, PREBLE

**Special Jurisdictional Note :** In Butler County the following townships are included: (Lemon Twp, Madison Twp) In Warren County the following townships are included: (Clear Creek Twp, Franklin Twp, Massie Twp, Turtle Creek Twp, Wayne Twp)

**Details :**



# Prevailing Wage Rate Skilled Crafts

**Name of Union: Boilermaker Local 105**

**Change # : LCN02-2013fbLoc 105**

**Craft : Boilermaker Effective Date : 10/01/2013 Last Posted : 09/25/2013**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Boilermaker	\$35.26		\$7.07	\$13.28	\$0.89	\$0.00	\$3.00	\$0.55	\$0.00	\$0.00	\$60.05	\$77.68
Apprentice	Percent											
1st 6 months	70.03	\$24.69	\$7.07	\$11.30	\$0.89	\$0.00	\$2.10	\$0.55	\$0.00	\$0.00	\$46.60	\$58.95
2nd 6 months	75.02	\$26.45	\$7.07	\$11.30	\$0.89	\$0.00	\$2.25	\$0.55	\$0.00	\$0.00	\$48.51	\$61.74
3rd 6 months	80.00	\$28.21	\$7.07	\$11.30	\$0.89	\$0.00	\$2.40	\$0.55	\$0.00	\$0.00	\$50.42	\$64.52
4th 6 months	85.02	\$29.98	\$7.07	\$11.30	\$0.89	\$0.00	\$2.55	\$0.55	\$0.00	\$0.00	\$52.34	\$67.33
5th 6 months	87.52	\$30.86	\$7.07	\$13.28	\$0.89	\$0.00	\$2.63	\$0.55	\$0.00	\$0.00	\$55.28	\$70.71
6th 6 months	90.03	\$31.74	\$7.07	\$13.28	\$0.89	\$0.00	\$2.70	\$0.55	\$0.00	\$0.00	\$56.23	\$72.11
7th 6 months	92.50	\$32.62	\$7.07	\$13.28	\$0.89	\$0.00	\$2.78	\$0.55	\$0.00	\$0.00	\$57.19	\$73.49
8th 6 months	95.00	\$33.50	\$7.07	\$13.28	\$0.89	\$0.00	\$2.85	\$0.55	\$0.00	\$0.00	\$58.14	\$74.89

**Special Calculation Note :** Other is Supplemental Health and Welfare

**Ratio :**

5 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ATHENS, BROWN, BUTLER, CHAMPAIGN, CLARK, CLERMONT, CLINTON, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA, GREENE, GUERNSEY, HAMILTON, HIGHLAND, HOCKING, JACKSON, LAWRENCE, LICKING, MADISON, MEIGS, MIAMI, MONTGOMERY, MORGAN, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, PREBLE, ROSS, SCIOTO, VINTON, WARREN

**Special Jurisdictional Note :**

**Details :**

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Carpenter Floorlayer SW District G**

**Change # : LCN01-2021sksLocSWDayton**

**Craft : Carpenter Effective Date : 10/06/2021 Last Posted : 10/06/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Carpenter Floorlayer	\$27.12		\$7.93	\$6.95	\$0.43	\$0.00	\$1.95	\$0.13	\$0.00	\$0.00	\$44.51	\$58.07
Apprentice	Percent											
1st 3 months	65.00	\$17.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$17.63	\$26.44
2nd 3 months	65.00	\$17.63	\$7.93	\$0.00	\$0.43	\$0.00	\$1.95	\$0.13	\$0.00	\$0.00	\$28.07	\$36.88
2nd 6 months	65.00	\$17.63	\$7.93	\$0.00	\$0.43	\$0.00	\$1.95	\$0.13	\$0.00	\$0.00	\$28.07	\$36.88
3rd 6 months	70.00	\$18.98	\$7.93	\$0.00	\$0.43	\$0.00	\$1.95	\$0.13	\$0.00	\$0.00	\$29.42	\$38.92
4th 6 months	75.00	\$20.34	\$7.93	\$0.00	\$0.43	\$0.00	\$1.95	\$0.13	\$0.00	\$0.00	\$30.78	\$40.95
5th 6 months	80.00	\$21.70	\$7.93	\$6.95	\$0.43	\$0.00	\$1.95	\$0.13	\$0.00	\$0.00	\$39.09	\$49.93
6th 6 months	85.00	\$23.05	\$7.93	\$6.95	\$0.43	\$0.00	\$1.95	\$0.13	\$0.00	\$0.00	\$40.44	\$51.97
7th 6 months	90.00	\$24.41	\$7.93	\$6.95	\$0.43	\$0.00	\$1.95	\$0.13	\$0.00	\$0.00	\$41.80	\$54.00
8th 6 months	95.00	\$25.76	\$7.93	\$6.95	\$0.43	\$0.00	\$1.95	\$0.13	\$0.00	\$0.00	\$43.15	\$56.04

**Special Calculation Note :** Other fs for UBC National Fund and Install

**Ratio :**

1 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

BROWN, BUTLER, CHAMPAIGN, CLARK, CLERMONT, CLINTON, DARKE, GREENE, HAMILTON, LOGAN, MIAMI, MONTGOMERY, PREBLE, SHELBY, WARREN

**Special Jurisdictional Note :**

**Details :**

Scope of work shall include, but not be limited to: receiving,unloading,handling,distribution and installation of all

carpeting materials, carpet padding or matting materials and all resilient materials whether for use on walls, floors, counter, sink, table and all preparation work necessary in connection therewith, including sanding work. the installation of nonstructural under-layment and the work of removing, cleaning waxing of any of the above. Carpeting shall include any floor covering composed of either natural or synthetic fibers that are made in breadths to be sewed, fastened or directly glued to floors or over cushioning sound-proofing materials. Resilient Floors shall consist of and include the laying of all special designs of wood, wood block, wood composition, cork, linoleum, asphalt, mastic, plastic, rubber tile, whether nailed or glued.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Carpenter Millwright Local 1090 SW Zone II**

**Change # : LCN01-2021sksLoc1066**

**Craft : Carpenter Effective Date : 09/22/2021 Last Posted : 09/22/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Carpenter Millwright	\$31.68		\$7.93	\$6.95	\$0.49	\$0.00	\$6.94	\$0.16	\$0.00	\$0.00	\$54.15	\$69.99
Apprentice	Percent											
1st 6 months	60.00	\$19.01	\$7.93	\$4.27	\$0.49	\$0.00	\$4.16	\$0.16	\$0.00	\$0.00	\$36.02	\$45.52
2nd 6 months	65.00	\$20.59	\$7.93	\$4.61	\$0.49	\$0.00	\$4.51	\$0.16	\$0.00	\$0.00	\$38.29	\$48.59
3rd 6 months	70.00	\$22.18	\$7.93	\$4.94	\$0.49	\$0.00	\$4.86	\$0.16	\$0.00	\$0.00	\$40.56	\$51.64
4th 6 months	75.00	\$23.76	\$7.93	\$5.28	\$0.49	\$0.00	\$5.21	\$0.16	\$0.00	\$0.00	\$42.83	\$54.71
5th 6 months	80.00	\$25.34	\$7.93	\$5.61	\$0.49	\$0.00	\$5.55	\$0.16	\$0.00	\$0.00	\$45.08	\$57.76
6th 6 months	85.00	\$26.93	\$7.93	\$5.95	\$0.49	\$0.00	\$5.90	\$0.16	\$0.00	\$0.00	\$47.36	\$60.82
7th 6 months	90.00	\$28.51	\$7.93	\$6.28	\$0.49	\$0.00	\$6.25	\$0.16	\$0.00	\$0.00	\$49.62	\$63.88
8th 6 months	95.00	\$30.10	\$7.93	\$6.62	\$0.49	\$0.00	\$6.59	\$0.16	\$0.00	\$0.00	\$51.89	\$66.93

**Special Calculation Note :** Other (\$0.16) \$0.11 National Fund and \$0.05 for National Millwright Fund.

**Ratio :**  
3 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ):**  
CHAMPAIGN, CLARK, DARKE, GREENE, LOGAN, MIAMI, MONTGOMERY, PREBLE, SHELBY

**Special Jurisdictional Note :**

**Details :**

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Carpenter NE District Industrial Dock & Door**

**Change # : LCN01-2014fbCarpNEStatewide**

**Craft : Carpenter Effective Date : 03/05/2014 Last Posted : 03/05/2014**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Carpenter	\$19.70		\$5.05	\$1.00	\$0.15	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$25.90	\$35.75
<b>Trainee</b>												
	<b>Percent</b>											
1st Year	60.00	\$11.82	\$5.05	\$1.00	\$0.15	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$18.02	\$23.93
2nd Year	80.20	\$15.80	\$5.05	\$1.00	\$0.15	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$22.00	\$29.90

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :**

1 Journeymen to 1 Trainee

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GEauga, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VAN WERT, VINTON, WARREN, WASHINGTON, WAYNE, WILLIAMS, WOOD, WYANDOT

**Special Jurisdictional Note :** Industrial Dock and Door is the installation of overhead doors, roll up doors and dock leveling equipment

**Details :**

10/27/10 New Contract jc

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Carpenter & Pile Driver  
SW Zone 1**

**Change # : LCN01-2021fbLoc126**

**Craft : Carpenter Effective Date : 07/14/2021 Last Posted : 07/14/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Carpenter	\$28.67		\$7.88	\$6.95	\$0.43	\$0.00	\$1.91	\$0.13	\$0.00	\$0.00	\$45.97	\$60.31
Pile Driver	\$25.84		\$6.62	\$6.95	\$0.40	\$0.00	\$0.91	\$0.10	\$0.00	\$0.00	\$40.82	\$53.74
Apprentice	Percent											
1st 3 Months	60.00	\$17.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$17.20	\$25.80
2nd 3 Months	60.00	\$17.20	\$7.88	\$0.00	\$0.43	\$0.00	\$1.91	\$0.13	\$0.00	\$0.00	\$27.55	\$36.15
2rd 6 Months	60.00	\$17.20	\$7.88	\$0.00	\$0.43	\$0.00	\$1.91	\$0.13	\$0.00	\$0.00	\$27.55	\$36.15
3th 6 Months	65.00	\$18.64	\$7.88	\$0.00	\$0.43	\$0.00	\$1.91	\$0.13	\$0.00	\$0.00	\$28.99	\$38.30
4th 6 Months	65.00	\$18.64	\$7.88	\$0.00	\$0.43	\$0.00	\$1.91	\$0.13	\$0.00	\$0.00	\$28.99	\$38.30
5th 6 Months	70.00	\$20.07	\$7.88	\$6.95	\$0.43	\$0.00	\$1.91	\$0.13	\$0.00	\$0.00	\$37.37	\$47.40
6th 6 Months	75.00	\$21.50	\$7.88	\$6.95	\$0.43	\$0.00	\$1.91	\$0.13	\$0.00	\$0.00	\$38.80	\$49.55
7th 6 Months	80.00	\$22.94	\$7.88	\$6.95	\$0.43	\$0.00	\$1.91	\$0.13	\$0.00	\$0.00	\$40.24	\$51.70
8th 6 Months	85.00	\$24.37	\$7.88	\$6.95	\$0.43	\$0.00	\$1.91	\$0.13	\$0.00	\$0.00	\$41.67	\$53.85

**Special Calculation Note :** Other is for UBC National Fund

**Ratio :**

- 1 Journeyman to 1 Apprentice
- 3 Journeyman to 1 Apprentice
- 5 Journeyman to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ):**

- CHAMPAIGN, CLARK, DARKE, GREENE, LOGAN, MIAMI, MONTGOMERY, PREBLE, SHELBY

**Special Jurisdictional Note :**

**Details :**

Carpenter duties shall include but not limited to: Pile driving, milling, fashioning, joining, assembling, erecting, fastening,

or dismantling of all material of wood,plastic,metal,fiber,cork,and composition, and all other substitute materials: pile driving,cutting,fitting,and placing of lagging, and the handling,cleaning,erecting,installing,and dismantling of machinery,equipment,and erecting pre-engineered metal buildings.

Pile Drivers work but not limited to: unloading, assembling,erection,repairs,operation,signaling,dismantling, and reloading all equipment that is used for pile driving including pile butts. pile butts is defined as sheeting or scrap piling. Underwater work that may be required in connection with the installation of piling. The diver and his tender work as a team and shall arrive at their own financial arrangements with the contractor.Any configuration of wood, steel, concrete, or composite that is jetted, driven, or vibrated onto the ground by conventional pile driving equipment for the purpose of supporting a future load that may be permanent or temporary.

Driving bracing,plumbing,cutting off and capping of all piling whether wood,metal,pipe piling or composite. loading, unloading, erecting, framing, dismantling, moving, and handling of pile driving equipment. piling used in the construction and repair of all wharves, docks, piers, trestles, caissons, cofferdams, and the erection of all sea walls and breakwaters. All underwater and marine work on bulkheads, wharves,docks,shipyards, caissons, piers, bridges, pipeline work, viaducts, marine cable and trestles, as well as salvage and reclamation work where divers are employed.

Rate shall include carpenters, acoustic, and ceiling installers, drywall installers, pile drivers, and floorlayers.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Carpenter & Pile Driver SW District HevHwy**

**Change # : LCN01-2021fbLoc126**

**Craft : Carpenter Effective Date : 06/17/2021 Last Posted : 06/17/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Carpenter	\$31.62		\$8.09	\$6.95	\$0.40	\$0.00	\$3.30	\$0.13	\$0.00	\$0.00	\$50.49	\$66.30
Pile Driver	\$29.34		\$6.63	\$6.95	\$0.40	\$0.00	\$1.97	\$0.10	\$0.00	\$0.00	\$45.39	\$60.06
<b>Apprentice</b>	<b>Percent</b>											
1st 6 Months	60.00	\$18.97	\$8.09	\$6.95	\$0.40	\$0.00	\$3.30	\$0.13	\$0.00	\$0.00	\$37.84	\$47.33
2nd 6 Months	65.00	\$20.55	\$8.09	\$6.95	\$0.40	\$0.00	\$3.30	\$0.13	\$0.00	\$0.00	\$39.42	\$49.70
3rd 6 Months	70.00	\$22.13	\$8.09	\$6.95	\$0.40	\$0.00	\$3.30	\$0.13	\$0.00	\$0.00	\$41.00	\$52.07
4th 6 Months	75.00	\$23.71	\$8.09	\$6.95	\$0.40	\$0.00	\$3.30	\$0.13	\$0.00	\$0.00	\$42.59	\$54.44
5th 6 Months	80.00	\$25.30	\$8.09	\$6.95	\$0.40	\$0.00	\$3.30	\$0.13	\$0.00	\$0.00	\$44.17	\$56.81
6th 6 Months	85.00	\$26.88	\$8.09	\$6.95	\$0.40	\$0.00	\$3.30	\$0.13	\$0.00	\$0.00	\$45.75	\$59.19
7th 6 Months	90.00	\$28.46	\$8.09	\$6.95	\$0.40	\$0.00	\$3.30	\$0.13	\$0.00	\$0.00	\$47.33	\$61.56
8th 6 Months	95.00	\$30.04	\$8.09	\$6.95	\$0.40	\$0.00	\$3.30	\$0.13	\$0.00	\$0.00	\$48.91	\$63.93

**Special Calculation Note : Other is UBC National Fund.**

**Ratio :**

1 Journeymen to 1 Apprentice

An employer shall have the right to employ one (1) Apprentice for one (1) Journeyman Carpenter in its employment for the first Apprentice employed, and 1 (1) Apprentice for two (2) Journeyman Carpenter for additional Apprentices employed. Thereafter, every third additional carpenter hired shall be an apprentice, if available, and if practical for the type of work being performed.

**Jurisdiction ( \* denotes special jurisdictional note ) :**

BROWN, BUTLER, CHAMPAIGN, CLARK, CLERMONT, CLINTON, DARKE, GREENE, HAMILTON, LOGAN, MIAMI, MONTGOMERY, PREBLE, SHELBY, WARREN



## **Special Jurisdictional Note :**

### **Details :**

Highway Construction, Airport Construction, Heavy Construction but not limited to:(tunnels,subways,drainage projects,flood control,reservoirs). Railroad Construction,Sewer Waterworks & Utility Construction but not limited to: (storm sewers, waterlines, gaslines). Industrial & Building Site, Power Plant, Amusement Park, Athletic Stadium Site, Sewer and Water Plants.

When the Contractor furnishes the necessary underwater gear for the Diver, the Diver shall be paid one and one half (1&1/2) times the journeyman rate for the time spent in the water.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Cement Mason Bricklayer Local 97 HevHwy A**

**Change # : LCN01-2021fbHvyHwy**

**Craft : Bricklayer Effective Date : 06/01/2021 Last Posted : 05/26/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Cement Mason Bricklayer Sewer Water Works A	\$30.40		\$9.50	\$7.57	\$0.48	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$47.95	\$63.15
<b>Apprentice</b>	<b>Percent</b>											
1st year	50.00	\$15.20	\$9.50	\$7.57	\$0.48	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$32.75	\$40.35
2nd year	70.00	\$21.28	\$9.50	\$7.57	\$0.48	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$38.83	\$49.47
3rd year	90.00	\$27.36	\$9.50	\$7.57	\$0.48	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$44.91	\$58.59

**Special Calculation Note : NOT FOR BUILDING CONSTRUCTION.**

**Ratio :**

- 3 Journeymen to 1 Apprentice
- 6 Journeymen to 2 Apprentice
- 9 Journeymen to 3 Apprentice
- 12 Journeymen to 4 Apprentice
- 15 Journeymen to 5 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VAN WERT, VINTON, WARREN, WASHINGTON, WAYNE

## **Special Jurisdictional Note :**

### **Details :**

(A) Highway Construction, Sewer, Waterworks And Utility Construction, Industrial & Building Site Heavy Construction, Airport Construction Or Railroad Construction Work.

(B) Power Plant, Tunnels, Amusement Park, Athletic Stadium Site Work ,Pollution Control,Sewer Plant, Waste Plant, & Water Treatment Facilities, Construction.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Cement Mason Bricklayer Local 97 HevHwy B**

**Change # : LCN01-2021fbHvyHwy**

**Craft : Bricklayer Effective Date : 06/01/2021 Last Posted : 05/26/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Cement Mason Bricklayer Power Plants Tunnels Amusement Parks B	\$31.39		\$9.50	\$7.57	\$0.49	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$48.95	\$64.64
<b>Apprentice</b>	<b>Percent</b>											
1st year	50.00	\$15.70	\$9.50	\$7.57	\$0.49	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$33.26	\$41.10
2nd year	70.00	\$21.97	\$9.50	\$7.57	\$0.49	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.53	\$50.52
3rd year	90.00	\$28.25	\$9.50	\$7.57	\$0.49	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.81	\$59.94

**Special Calculation Note : NOT FOR BUILDING CONSTRUCTION.**

**Ratio :**

- 3 Journeymen to 1 Apprentice
- 6 Journeymen to 2 Apprentice
- 9 Journeymen to 2 Apprentice
- 12 Journeymen to 4 Apprentice
- 15 Journeymen to 5 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VAN WERT, VINTON,

WARREN, WASHINGTON, WAYNE

**Special Jurisdictional Note :**

**Details :**

(A) Highway Construction, Sewer, Waterworks And Utility Construction, Industrial & Building Site Heavy Construction, Airport Construction Or Railroad Construction Work.

(B) Power Plant, Tunnels, Amusement Park, Athletic Stadium Site Work ,Pollution Control,Sewer Plant, Waste Plant, & Water Treatment Facilities, Construction.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Cement Mason Local 132 (Dayton)**

**Change # : LCN01-2021fbLoc132**

**Craft : Cement Effective Date : 06/24/2021 Last Posted : 06/24/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Cement Mason	\$25.22		\$7.75	\$7.35	\$0.75	\$0.00	\$2.25	\$0.00	\$0.00	\$0.00	\$43.32	\$55.93
<b>Apprentice</b>	<b>Percent</b>											
1st Six Months	70.00	\$17.65	\$7.75	\$7.35	\$0.75	\$0.00	\$2.25	\$0.00	\$0.00	\$0.00	\$35.75	\$44.58
2nd Six Months	80.00	\$20.18	\$7.75	\$7.35	\$0.75	\$0.00	\$2.25	\$0.00	\$0.00	\$0.00	\$38.28	\$48.36
3rd Six Months	90.00	\$22.70	\$7.75	\$7.35	\$0.75	\$0.00	\$2.25	\$0.00	\$0.00	\$0.00	\$40.80	\$52.15

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :**

2 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

CHAMPAIGN, CLARK, CLINTON, DARKE, GREENE, MIAMI, MONTGOMERY, PREBLE, SHELBY

**Special Jurisdictional Note :**

**Details :**

Other: Is Industry Promotion: Cement Masons on outrigger, swing, scaffolds, manlifts -\$.75 per hour above scale up to (25) feet and \$.75 per hour for each additional (25) feet or part of same. A Cement Mason operating a grinder- \$.30 per hour above the journeyman scale.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Cement Mason Statewide HevHwy Exhibit A District III**

**Change # : OCN01-2021fbCementHevHwy**

**Craft : Cement Mason Effective Date : 05/01/2021 Last Posted : 04/23/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Cement Mason	\$30.50		\$8.25	\$7.35	\$0.65	\$0.00	\$2.25	\$0.07	\$0.00	\$0.00	\$49.07	\$64.32
<b>Apprentice</b>												
	<b>Percent</b>											
1st Year	70.00	\$21.35	\$8.25	\$7.35	\$0.65	\$0.00	\$2.25	\$0.07	\$0.00	\$0.00	\$39.92	\$50.60
2nd Year	80.00	\$24.40	\$8.25	\$7.35	\$0.65	\$0.00	\$2.25	\$0.07	\$0.00	\$0.00	\$42.97	\$55.17
3rd Year	90.00	\$27.45	\$8.25	\$7.35	\$0.65	\$0.00	\$2.25	\$0.07	\$0.00	\$0.00	\$46.02	\$59.75

**Special Calculation Note :** Other \$0.07 is for International Training Fund

**Ratio :**

1 Journeymen to 1 Apprentice  
2 to 1 thereafter

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ASHLAND, ATHENS, BELMONT, CHAMPAIGN, CLARK, CLINTON, COSHOCTON, CRAWFORD, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA, GREENE, GUERNSEY, HARRISON, HOCKING, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, MADISON, MARION, MEIGS, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, PREBLE, RICHLAND, ROSS, SCIOTO, SHELBY, UNION, VINTON, WASHINGTON, WYANDOT

**Special Jurisdictional Note :** (A) Highway Construction, Sewer, Waterworks And Utility Construction, Industrial & Building Site, Heavy Construction, Airport Construction Or Railroad Construction Work.

**Details :**

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Cement Mason Statewide HevHwy Exhibit B District III**

**Change # : OCN01-2021fbCementHevHwy**

**Craft : Cement Mason Effective Date : 05/01/2021 Last Posted : 04/23/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Cement Mason	\$30.66		\$8.25	\$7.35	\$0.65	\$0.00	\$2.25	\$0.07	\$0.00	\$0.00	\$49.23	\$64.56
<b>Apprentice</b>												
	<b>Percent</b>											
1st Year	70.00	\$21.46	\$8.25	\$7.35	\$0.65	\$0.00	\$2.25	\$0.07	\$0.00	\$0.00	\$40.03	\$50.76
2nd Year	80.00	\$24.53	\$8.25	\$7.35	\$0.65	\$0.00	\$2.25	\$0.07	\$0.00	\$0.00	\$43.10	\$55.36
3rd Year	90.00	\$27.59	\$8.25	\$7.35	\$0.65	\$0.00	\$2.25	\$0.07	\$0.00	\$0.00	\$46.16	\$59.96

**Special Calculation Note :** Other \$0.07 is for International Training Fund

**Ratio :**

1 Journeymen to 1 Apprentice  
2 to 1 thereafter

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ASHLAND, ATHENS, BELMONT, CHAMPAIGN, CLARK, CLINTON, COSHOCTON, CRAWFORD, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA, GREENE, GUERNSEY, HARRISON, HOCKING, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, MADISON, MARION, MEIGS, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, PREBLE, RICHLAND, ROSS, SCIOTO, SHELBY, UNION, VINTON, WASHINGTON, WYANDOT

**Special Jurisdictional Note :** (B) Power Plant, Tunnels, Amusement Park, Athletic Stadium Site Work, Pollution Control, Sewer Plant, Waste Plant, & Water Treatment Facilities, Construction.

**Details :**



# Prevailing Wage Rate Skilled Crafts

**Name of Union: Electrical Local 71 DOT Traffic Signal Highway Lighting American Line Builders**

**Change # : LCRO1-2021fbLoc71DOTClev**

**Craft : Lineman Effective Date : 03/16/2021 Last Posted : 03/16/2021**

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrical Lineman	\$40.31	\$6.75	\$1.21	\$0.40	\$0.00	\$7.66	\$0.06	\$0.00	\$0.00	\$56.39	\$76.54
Traffic Signal & Lighting Journeyman	\$38.77	\$6.75	\$1.16	\$0.39	\$0.00	\$7.37	\$0.06	\$0.00	\$0.00	\$54.50	\$73.89
Equipment Operator	\$35.41	\$6.75	\$1.06	\$0.35	\$0.00	\$6.73	\$0.06	\$0.00	\$0.00	\$50.36	\$68.06
Groundman 0 to 12 months (W/O CDL)	\$21.47	\$6.75	\$0.64	\$0.21	\$0.00	\$4.08	\$0.06	\$0.00	\$0.00	\$33.21	\$43.95
Groundman 0 to 12 Months (W CDL)	\$23.46	\$6.75	\$0.70	\$0.23	\$0.00	\$4.46	\$0.06	\$0.00	\$0.00	\$35.66	\$47.39
Groundman greater than 1 year (W CDL)	\$25.45	\$6.75	\$0.76	\$0.25	\$0.00	\$4.84	\$0.06	\$0.00	\$0.00	\$38.11	\$50.83
Traffic Apprentice											
1st 1000 hrs	\$23.26	\$6.75	\$0.70	\$0.23	\$0.00	\$4.42	\$0.06	\$0.00	\$0.00	\$35.42	\$47.05
2nd 1000 hrs	\$25.20	\$6.75	\$0.76	\$0.25	\$0.00	\$4.79	\$0.06	\$0.00	\$0.00	\$37.81	\$50.41
3rd 1000 hrs	\$27.14	\$6.75	\$0.81	\$0.27	\$0.00	\$5.16	\$0.06	\$0.00	\$0.00	\$40.19	\$53.76
4th 1000 hrs	\$29.08	\$6.75	\$0.87	\$0.29	\$0.00	\$5.53	\$0.06	\$0.00	\$0.00	\$42.58	\$57.12
5th 1000 hrs	\$31.01	\$6.75	\$0.93	\$0.31	\$0.00	\$5.89	\$0.06	\$0.00	\$0.00	\$44.95	\$60.46
6th 1000 hrs	\$34.89	\$6.75	\$1.05	\$0.35	\$0.00	\$6.63	\$0.06	\$0.00	\$0.00	\$49.73	\$67.17
<b>Lineman Apprentice</b>	<b>Percent</b>										

1st 1,000 Hours	60.00	\$24.19	\$6.75	\$0.73	\$0.24	\$0.00	\$4.60	\$0.06	\$0.00	\$0.00	\$36.57	\$48.66
2nd 1,000 Hours	65.00	\$26.20	\$6.75	\$0.79	\$0.26	\$0.00	\$4.98	\$0.06	\$0.00	\$0.00	\$39.04	\$52.14
3rd 1,000 Hours	70.00	\$28.22	\$6.75	\$0.85	\$0.28	\$0.00	\$5.36	\$0.06	\$0.00	\$0.00	\$41.52	\$55.63
4th 1,000 Hours	75.00	\$30.23	\$6.75	\$0.91	\$0.30	\$0.00	\$5.74	\$0.06	\$0.00	\$0.00	\$43.99	\$59.11
5th 1,000 Hours	80.00	\$32.25	\$6.75	\$0.97	\$0.32	\$0.00	\$6.13	\$0.06	\$0.00	\$0.00	\$46.48	\$62.60
6th 1,000 Hours	85.00	\$34.26	\$6.75	\$1.03	\$0.34	\$0.00	\$6.51	\$0.06	\$0.00	\$0.00	\$48.95	\$66.09
7th 1,000 Hours	90.00	\$36.28	\$6.75	\$1.09	\$0.36	\$0.00	\$6.89	\$0.06	\$0.00	\$0.00	\$51.43	\$69.57

**Special Calculation Note :** Other is for Safety and Education Fund

**Ratio :**

1 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

AUGLAIZE, CHAMPAIGN, CLARK, CLINTON, DARKE, GREENE, LOGAN, MERCER, MIAMI, MONTGOMERY, PREBLE, SHELBY

**Special Jurisdictional Note :**

**Details :**

A groundman when directed shall assist a Journeymen in the performance of his/her work on the ground, including the use of hand tools. Under no circumstances shall this classification climb poles, towers, ladders, or work from an elevated platform or bucket truck. This classification shall not perform work normally assigned to an apprentice lineman. No more than three (3) Groundmen shall work alone. Jobs with more that three Groundmen shall be supervised by a Groundcrew Foreman, Journeyman Lineman, Journeyman Traffic Signal Technician or an Equipment Operator.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 71 High Tension Pipe Type Cable

Change # : LCN01-2021fbLoc7

Craft : Lineman Effective Date : 03/16/2021 Last Posted : 03/16/2021

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrical Lineman	\$45.61	\$6.75	\$1.37	\$0.46	\$0.00	\$10.95	\$0.60	\$0.00	\$0.00	\$65.74	\$88.54
Certified Lineman Welder	\$45.61	\$6.75	\$1.37	\$0.46	\$0.00	\$10.95	\$0.60	\$0.00	\$0.00	\$65.74	\$88.54
Certified Cable Splicer	\$45.61	\$6.75	\$1.37	\$0.46	\$0.00	\$10.95	\$0.60	\$0.00	\$0.00	\$65.74	\$88.54
Operator A	\$40.88	\$6.75	\$1.23	\$0.41	\$0.00	\$9.81	\$0.60	\$0.00	\$0.00	\$59.68	\$80.12
Operator B	\$36.20	\$6.75	\$1.09	\$0.36	\$0.00	\$8.69	\$0.60	\$0.00	\$0.00	\$53.69	\$71.79
Operator C	\$29.12	\$6.75	\$0.87	\$0.29	\$0.00	\$6.99	\$0.60	\$0.00	\$0.00	\$44.62	\$59.18
Groundman 0-12 months Exp	\$22.81	\$6.75	\$0.68	\$0.23	\$0.00	\$5.47	\$0.60	\$0.00	\$0.00	\$36.54	\$47.94
Groundman 0-12 months Exp w/CDL	\$25.09	\$6.75	\$0.75	\$0.25	\$0.00	\$6.02	\$0.60	\$0.00	\$0.00	\$39.46	\$52.01
Groundman 1 yr or more	\$25.09	\$6.75	\$0.75	\$0.25	\$0.00	\$6.02	\$0.60	\$0.00	\$0.00	\$39.46	\$52.01
Groundman 1 yr or more w/CDL	\$29.65	\$6.75	\$0.85	\$0.28	\$0.00	\$6.50	\$0.60	\$0.00	\$0.00	\$44.63	\$59.46
Equipment Mechanic A	\$36.20	\$6.75	\$1.09	\$0.36	\$0.00	\$8.69	\$0.60	\$0.00	\$0.00	\$53.69	\$71.79
Equipment Mechanic B	\$32.66	\$6.75	\$0.98	\$0.33	\$0.00	\$7.84	\$0.60	\$0.00	\$0.00	\$49.16	\$65.49
Equipment Mechanic C	\$29.12	\$6.75	\$0.87	\$0.29	\$0.00	\$6.99	\$0.60	\$0.00	\$0.00	\$44.62	\$59.18
X-Ray Technician	\$45.61	\$6.75	\$1.37	\$0.46	\$0.00	\$10.95	\$0.60	\$0.00	\$0.00	\$65.74	\$88.54

Apprentice	Percent											
1st 1000 hrs	60.00	\$27.37	\$6.75	\$0.82	\$0.27	\$0.00	\$6.57	\$0.60	\$0.00	\$0.00	\$42.38	\$56.06
2nd 1000 hrs	65.00	\$29.65	\$6.75	\$0.89	\$0.30	\$0.00	\$7.12	\$0.60	\$0.00	\$0.00	\$45.31	\$60.13
3rd 1000 hrs	70.00	\$31.93	\$6.75	\$0.96	\$0.32	\$0.00	\$7.66	\$0.60	\$0.00	\$0.00	\$48.22	\$64.18
4th 1000 hrs	75.00	\$34.21	\$6.75	\$1.03	\$0.34	\$0.00	\$8.21	\$0.60	\$0.00	\$0.00	\$51.14	\$68.24
5th 1000 hrs	80.00	\$36.49	\$6.75	\$1.09	\$0.36	\$0.00	\$8.76	\$0.60	\$0.00	\$0.00	\$54.05	\$72.29
6th 1000 hrs	85.00	\$38.77	\$6.75	\$1.16	\$0.39	\$0.00	\$9.30	\$0.60	\$0.00	\$0.00	\$56.97	\$76.35
7th 1000 hrs	90.00	\$41.05	\$6.75	\$1.23	\$0.41	\$0.00	\$9.85	\$0.60	\$0.00	\$0.00	\$59.89	\$80.41

**Special Calculation Note :** Other is Health Retirement Account

**Operator "A"**

John Henry Rock Drill, D-6 (or equivalent) and above, Trackhoe Digger, (320 Track excavator), Cranes (greater then 25 tons and less than 45 tons).

**Operator "B"**

Cranes (greater than 6 tons and up to 25 tons), Backhoes, Road Tractor, Dozer up to D-5, Pressure Digger-wheeled or tracked, all Tension wire Stringing equipment.

**Operator "C"**

Trench, Backhoe, Riding type vibratory Compactor, Ground Rod Driver, Boom Truck (6 ton & below), Skid Steer Loaders, Material Handler.

\*All Operators of cranes 45 ton or larger shall be paid the journeyman rate of pay. \$0.30 is for Health Retirement Account.

**Ratio :**

1 Journeyman to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HARRISON, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, RICHLAND, ROSS, SCIOTO, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VINTON, WARREN,

WASHINGTON, WAYNE

**Special Jurisdictional Note :**

**Details :**

Heli - Arc Welding will be paid \$.30 above Journeyman rate. Additional compensation of 10% over the Journeyman Lineman and Journeyman Technician for performing work on structures outside of buildings such as water towers, smoke stacks, radio and television towers, more than 75' above the ground.

# Prevailing Wage Rate Skilled Crafts

Name of Union: **Electrical Local 71 Outside Utility Power**

**Change # : LCN01-2021fbLoc7**

**Craft : Lineman Effective Date : 03/16/2021 Last Posted : 03/16/2021**

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrical Lineman	\$43.22	\$6.75	\$1.30	\$0.43	\$0.00	\$10.37	\$0.60	\$0.00	\$0.00	\$62.67	\$84.28
Substation Technician	\$43.22	\$6.75	\$1.30	\$0.43	\$0.00	\$10.37	\$0.60	\$0.00	\$0.00	\$62.67	\$84.28
Cable Splicer	\$45.26	\$6.75	\$1.36	\$0.45	\$0.00	\$10.86	\$0.60	\$0.00	\$0.00	\$65.28	\$87.91
Operator A	\$38.75	\$6.75	\$1.16	\$0.39	\$0.00	\$9.30	\$0.60	\$0.00	\$0.00	\$56.95	\$76.32
Operator B	\$34.27	\$6.75	\$1.03	\$0.34	\$0.00	\$8.22	\$0.60	\$0.00	\$0.00	\$51.21	\$68.34
Operator C	\$27.54	\$6.75	\$0.83	\$0.28	\$0.00	\$6.61	\$0.60	\$0.00	\$0.00	\$42.61	\$56.38
Groundman 0-12 months Exp	\$21.61	\$6.75	\$0.65	\$0.22	\$0.00	\$5.19	\$0.60	\$0.00	\$0.00	\$35.02	\$45.82
Groundman 0-12 months Exp w/CDL	\$23.77	\$6.75	\$0.71	\$0.24	\$0.00	\$5.70	\$0.60	\$0.00	\$0.00	\$37.77	\$49.66
Groundman 1 yr or more	\$23.77	\$6.75	\$0.71	\$0.24	\$0.00	\$5.70	\$0.60	\$0.00	\$0.00	\$37.77	\$49.66
Groundman 1 yr or more w/CDL	\$28.09	\$6.75	\$0.84	\$0.28	\$0.00	\$6.74	\$0.60	\$0.00	\$0.00	\$43.30	\$57.35
Equipment Mechanic A	\$34.27	\$6.75	\$1.03	\$0.34	\$0.00	\$8.22	\$0.60	\$0.00	\$0.00	\$51.21	\$68.34
Equipment Mechanic B	\$30.91	\$6.75	\$0.93	\$0.31	\$0.00	\$7.42	\$0.60	\$0.00	\$0.00	\$46.92	\$62.38
Equipment Mechanic C	\$27.54	\$6.75	\$0.83	\$0.28	\$0.00	\$6.61	\$0.60	\$0.00	\$0.00	\$42.61	\$56.38
Line Truck w/uuger	\$30.44	\$6.75	\$0.91	\$0.30	\$0.00	\$7.31	\$0.60	\$0.00	\$0.00	\$46.31	\$61.53
<b>Apprentice</b>	<b>Percent</b>										

1st 1000 hrs	60.00	\$25.93	\$6.75	\$0.78	\$0.26	\$0.00	\$6.22	\$0.60	\$0.00	\$0.00	\$40.54	\$53.51
2nd 1000 hrs	65.00	\$28.09	\$6.75	\$0.84	\$0.28	\$0.00	\$6.74	\$0.60	\$0.00	\$0.00	\$43.30	\$57.35
3rd 1000 hrs	70.00	\$30.25	\$6.75	\$0.91	\$0.30	\$0.00	\$7.26	\$0.60	\$0.00	\$0.00	\$46.07	\$61.20
4th 1000 hrs	75.00	\$32.42	\$6.75	\$0.97	\$0.32	\$0.00	\$7.78	\$0.60	\$0.00	\$0.00	\$48.84	\$65.04
5th 1000 hrs	80.00	\$34.58	\$6.75	\$1.04	\$0.35	\$0.00	\$8.30	\$0.60	\$0.00	\$0.00	\$51.62	\$68.90
6th 1000 hrs	85.00	\$36.74	\$6.75	\$1.10	\$0.37	\$0.00	\$8.82	\$0.60	\$0.00	\$0.00	\$54.38	\$72.75
7th 1000 hrs	90.00	\$38.90	\$6.75	\$1.17	\$0.39	\$0.00	\$9.34	\$0.60	\$0.00	\$0.00	\$57.15	\$76.60

**Special Calculation Note :** Other is Health Retirement Account

**Operator "A"**

John Henry Rock Drill, D-6 (or equivalent) and above, Trackhoe Digger, (320 Track excavator), Cranes (greater than 25 tons and less than 45 tons).

**Operator "B"**

Cranes (greater than 6 tons and up to 25 tons), Backhoes, Road Tractor, Dozer up to D-5, Pressure Digger-wheeled or tracked, all Tension wire Stringing equipment.

**Operator "C"**

Trench, Backhoe, Riding type vibratory Compactor, Ground Rod Driver, Boom Truck (6 ton & below), Skid Steer Loaders, Material Handler.

**Ratio :**

(1) Journeyman Lineman to (1) Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HARRISON, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, RICHLAND, ROSS, SCIOTO, SHELBY, STARK, SUMMIT, TRUMBULL, TUSCARAWAS, UNION, VINTON, WARREN, WASHINGTON, WAYNE

**Special Jurisdictional Note :** 0.30 is for Health Retirement Account.

**Details :**

Heli - Arc Welding will be paid \$.30 above Journeyman rate. Additional compensation of 10% over the Journeyman Lineman and Journeyman Technician for performing work on structures outside of buildings such as water towers,

smoke stacks, radio and television towers, more than 75' above the ground.



# Prevailing Wage Rate Skilled Crafts

**Name of Union: Electrical Local 71 Voice Data Video Outside**

**Change # : LCR01-2017fbLoc71VDV**

**Craft : Voice Data Video Effective Date : 10/18/2017 Last Posted : 10/18/2017**

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrical Installer Technician I	\$23.46	\$5.50	\$0.70	\$0.00	\$0.00	\$0.30	\$0.00	\$0.00	\$0.00	\$29.96	\$41.69
Installer Technician II	\$22.37	\$5.50	\$0.67	\$0.00	\$0.00	\$0.30	\$0.00	\$0.00	\$0.00	\$28.84	\$40.03
Equipment Operator I	\$22.37	\$5.50	\$0.67	\$0.00	\$0.00	\$0.30	\$0.00	\$0.00	\$0.00	\$28.84	\$40.03
Equipment Operator II	\$18.43	\$5.50	\$0.55	\$0.00	\$0.00	\$0.30	\$0.00	\$0.00	\$0.00	\$24.78	\$33.99
Installer/Repair Outside	\$22.37	\$5.50	\$0.67	\$0.00	\$0.00	\$0.30	\$0.00	\$0.00	\$0.00	\$28.84	\$40.03
Ground Driver W/CDL	\$15.83	\$5.50	\$0.47	\$0.00	\$0.00	\$0.30	\$0.00	\$0.00	\$0.00	\$22.10	\$30.01
Groundman	\$13.24	\$5.50	\$0.40	\$0.00	\$0.00	\$0.30	\$0.00	\$0.00	\$0.00	\$19.44	\$26.06
Cable Splicer	\$23.46	\$5.50	\$0.70	\$0.00	\$0.00	\$0.30	\$0.00	\$0.00	\$0.00	\$29.96	\$41.69

**Special Calculation Note :**

**Ratio :**

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HARRISON, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI,

MONROE, MONTGOMERY, MORGAN, MORROW,  
MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE,  
PORTAGE, PREBLE, RICHLAND, ROSS, SCIOTO,  
SHELBY, STARK, SUMMIT, TRUMBULL,  
TUSCARAWAS, UNION, VINTON, WARREN,  
WASHINGTON, WAYNE

## **Special Jurisdictional Note :**

### **Details :**

**Cable Splicer:** Inspect and test lines or cables, analyze results, and evaluate transmission characteristics. Cover conductors with insulation or seal splices with moisture-proof covering. Install, splice, test, and repair cables using tools or mechanical equipment. This will include the splicing of fiber.

**Journeyman Technician I:** Must know all aspects of telephone and cable work. This is to include aerial, underground, and manhole work. Must know how to climb and run bucket. Must have all the tools required to perform these tasks. Must be able to be responsible for the safety of the crew at all times. Must also have CDL license and have at least 5 years experience.

**Installer/Repairman:** Perform tasks of repairing, installing, and testing phone and CATV services.

**Technician II:** Have at least three years of telephone and CATV experience. Must have the knowledge of underground, aerial, and manhole work. Must be able to climb and operate bucket. Must have CDL. Must have all tools needed to perform these tasks.

**Equipment Operator I:** Able to operate a digger derrick or bucket truck. Have at least 5 years of experience and must have a valid CDL license.

**Equipment Operator II:** Able to operate a digger derrick or bucket truck. Have at least 3 years of experience and must have a valid CDL license.

**Groundman W/CDL:** Must have a valid CDL license and be able to perform tasks such as: climbing poles, pulling downguys, making up material, and getting appropriate tools for the job. Must have at least 5 year's experience.

**Groundman:** Perform tasks such as: climbing poles, pulling downguys, making up material, and getting appropriate tools for the job. Experience 0-5 years.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Electrical Local 82 Inside

**Change # : LCN01-2021sksLoc82in**

**Craft : Electrical Effective Date : 11/29/2021 Last Posted : 11/24/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Electrician	\$33.25		\$7.45	\$9.35	\$0.57	\$0.00	\$3.50	\$0.00	\$0.00	\$0.00	\$54.12	\$70.74
Apprentice	Percent											
1st period 0 - 1000 hrs	42.00	\$13.97	\$4.07	\$0.62	\$0.24	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$18.89	\$25.88
2nd period 1001-2000 hrs	42.00	\$13.97	\$4.07	\$0.62	\$0.24	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$18.89	\$25.88
3rd period 2001-3500 hrs	47.00	\$15.63	\$6.92	\$4.39	\$0.27	\$0.00	\$1.65	\$0.00	\$0.00	\$0.00	\$28.86	\$36.67
4th period 3501-5000 hrs	52.00	\$17.29	\$6.97	\$4.86	\$0.29	\$0.00	\$1.82	\$0.00	\$0.00	\$0.00	\$31.23	\$39.88
5th period 5001-6500 hrs	62.03	\$20.62	\$7.07	\$5.80	\$0.35	\$0.00	\$2.17	\$0.00	\$0.00	\$0.00	\$36.01	\$46.33
6th period 6501-8000 hrs	77.00	\$25.60	\$7.22	\$7.20	\$0.44	\$0.00	\$2.70	\$0.00	\$0.00	\$0.00	\$43.16	\$55.96

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :**

1 to 3 Journeymen to 3 Apprentices  
4 to 6 Journeymen to 6 Apprentices  
per job site

**Jurisdiction ( \* denotes special jurisdictional note ):**

CLINTON, DARKE, GREENE, MIAMI,  
MONTGOMERY, PREBLE, WARREN\*

**Special Jurisdictional Note :** The following townships in Warren County are included: Clearcreek, Franklin and Wayne.

**Details :**

Only correction made on 6-19-19 was the 5th year Apprentice fb.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Electrical Local 82 Inside Lt Commercial South West**

**Change # : LCNO2-2020fbLoc82in**

**Craft : Electrical Effective Date : 01/01/2021 Last Posted : 12/24/2020**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Electrician	\$32.15		\$6.35	\$9.31	\$0.68	\$0.00	\$3.20	\$0.00	\$0.00	\$0.00	\$51.69	\$67.76
CE-3 12,001-14,000	\$23.03		\$6.35	\$0.69	\$0.68	\$0.00	\$0.68	\$0.00	\$0.00	\$0.10	\$31.53	\$43.05
CE-2 10,001-12,000 Hrs	\$18.10		\$6.35	\$0.54	\$0.68	\$0.00	\$0.54	\$0.00	\$0.00	\$0.10	\$26.31	\$35.36
CE-1 8,001-10,000 Hrs	\$16.45		\$6.35	\$0.49	\$0.68	\$0.00	\$0.49	\$0.00	\$0.00	\$0.10	\$24.56	\$32.79
CW-4 6,001-8,000 Hrs	\$14.81		\$6.35	\$0.44	\$0.68	\$0.00	\$0.44	\$0.00	\$0.00	\$0.10	\$22.82	\$30.23
CW-3 4,001-6,000 Hrs	\$13.16		\$6.35	\$0.39	\$0.68	\$0.00	\$0.39	\$0.00	\$0.00	\$0.10	\$21.07	\$27.65
CW-2 2,001-4,000 Hrs	\$12.34		\$6.35	\$0.37	\$0.68	\$0.00	\$0.37	\$0.00	\$0.00	\$0.10	\$20.21	\$26.38
CW-1 0-2,000 Hrs	\$11.52		\$6.35	\$0.35	\$0.68	\$0.00	\$0.35	\$0.00	\$0.00	\$0.10	\$19.35	\$25.11
<b>Apprentice</b>	<b>Percent</b>											
1st period 0 - 1000 hrs	42.00	\$13.50	\$4.07	\$0.20	\$0.23	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$18.00	\$24.75
2nd period 1001-2000 hrs	42.00	\$13.50	\$4.07	\$0.20	\$0.23	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$18.00	\$24.75
3rd period 2001-3500 hrs	47.00	\$15.11	\$6.92	\$3.92	\$0.26	\$0.00	\$1.50	\$0.00	\$0.00	\$0.00	\$27.71	\$35.27
4th period 3501-5000 hrs	52.00	\$16.72	\$6.97	\$4.34	\$0.28	\$0.00	\$1.66	\$0.00	\$0.00	\$0.00	\$29.97	\$38.33
5th period 5001-6500	62.00	\$19.93	\$7.07	\$5.18	\$0.34	\$0.00	\$1.98	\$0.00	\$0.00	\$0.00	\$34.50	\$44.47

hrs												
6th period 6501-8000 hrs	77.00	\$24.76	\$7.22	\$6.43	\$0.42	\$0.00	\$2.46	\$0.00	\$0.00	\$0.00	\$41.29	\$53.66

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :**

1 to 3 Journeymen to 3 Apprentices  
 4 to 6 Journeymen to 6 Apprentices  
 per job site

**Jurisdiction ( \* denotes special jurisdictional note ) :**

CLINTON, DARKE, GREENE, MIAMI,  
 MONTGOMERY, PREBLE, WARREN\*

**Construction Electrician and Construction Wireman Ratio**  
 There shall be a minimum ratio of one inside Journeyman to every (4) employees of different classification per jobsite.  
 An inside Journeyman Wireman is required on the project as the fifth (5th) worker or when apprentices are used.

**Special Jurisdictional Note :** The following townships in Warren County are included: Clearcreek, Franklin and Wayne.

The scope of work for the light commercial agreement shall apply to the following facilities not to exceed 200,000 square feet; office buildings, shopping centers, auto sales agencies and garages, churches, funeral homes, nursing homes, hotels, retail and wholesale facilities, small stand-alone manufacturing facilities when free standing and not part of a larger facility (not to exceed 50,000 square fee), solar projects (500 panels or less) unless otherwise covered under the agreement, lighting retrofits (when not associated with remodels involving branch re-circuiting) lighting retrofits shall be defined as the changing of lamps and ballasts in existing light fixtures and shall also include the one for one replacement of existing fixtures, warehouses, gas stations, food service centers, restaurants, entertainment facilities, hospitals, clinics, motels, residential buildings.

**Details :**

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Electrical Local 82 Lightning Rod**

**Change # : LCR01-2020fbLoc82**

**Craft : Electrical Effective Date : 11/30/2020 Last Posted : 11/25/2020**

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
<b>Classification</b>											
Electrical Lightning Rod Technican	\$30.79	\$7.45	\$9.27	\$0.00	\$0.00	\$3.20	\$0.00	\$0.00	\$0.00	\$50.71	\$66.10

**Special Calculation Note :** No Apprentice approved by OSAC.

**Ratio :** **Jurisdiction ( \* denotes special jurisdictional note ) :**  
CLINTON, DARKE, GREENE, MIAMI,  
MONTGOMERY, PREBLE, WARREN\*

**Special Jurisdictional Note :** The following townships in Warren County are included: (Clearcreek, Franklin and Wayne)

**Details :**

.

# Prevailing Wage Rate Skilled Crafts

Name of Union: **Electrical Local 82 Voice Data Video**

**Change # : LCN01-2021sksLoc82VDV**

**Craft : Voice Data Video Effective Date : 11/29/2021 Last Posted : 11/24/2021**

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Electrical Installer Technician A	\$25.95	\$6.60	\$0.78	\$0.49	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$38.22	\$51.20
Electrical Installer Technician B	\$24.65	\$6.60	\$0.74	\$0.47	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$36.86	\$49.18
JW Installer Technician	\$23.36	\$6.60	\$0.70	\$0.44	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$35.50	\$47.18
NON BICSI Installer	\$16.87	\$3.00	\$0.51	\$0.32	\$0.00	\$2.00	\$0.00	\$0.00	\$0.00	\$22.70	\$31.14
Apprentice Indentured prior to 09-03-2018											
1st Period 0-1000 Hrs	\$12.98	\$6.60	\$0.39	\$0.25	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$20.47	\$26.96
2nd Period 1001-2000 Hrs	\$12.98	\$6.60	\$0.39	\$0.25	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$20.47	\$26.96
3rd Period 2001-3000 Hrs	\$15.57	\$6.60	\$0.47	\$0.30	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$27.34	\$35.13
4th Period 3001-4000Hrs	\$16.87	\$6.60	\$0.51	\$0.32	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$28.70	\$37.14
5th Period 4001-5000 Hrs	\$18.17	\$6.60	\$0.55	\$0.35	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$30.07	\$39.16
6th Period 5001-6000 Hrs	\$19.46	\$6.60	\$0.58	\$0.37	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$31.41	\$41.14
Cable	\$12.98	\$3.00	\$0.39	\$0.25	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$16.87	\$23.36

Puller	Percent											
Apprentice Indentured After 09-03-2018												
1st 0-1000 hours	55.00	\$14.27	\$3.00	\$0.43	\$0.27	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$18.22	\$25.36
2nd 1001-2000 hours	55.00	\$14.27	\$3.00	\$0.43	\$0.27	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$18.22	\$25.36
3rd 2001-3000 hours	65.00	\$16.87	\$6.50	\$0.51	\$0.32	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$28.60	\$37.03
4th 3001-4000 hours	65.00	\$16.87	\$6.50	\$0.51	\$0.32	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$28.60	\$37.03
5th 4001-5000 hours	75.00	\$19.46	\$6.53	\$0.58	\$0.37	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$31.34	\$41.07
6th 5001-6000 hours	75.00	\$19.46	\$6.53	\$0.58	\$0.37	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$31.34	\$41.07
7th 6001-7000 hours	80.00	\$20.76	\$6.54	\$0.62	\$0.39	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$32.71	\$43.09
8th 7001 hours	80.00	\$20.76	\$6.54	\$0.62	\$0.39	\$0.00	\$4.40	\$0.00	\$0.00	\$0.00	\$32.71	\$43.09
Cable Puller	50.00	\$12.98	\$3.00	\$0.39	\$0.25	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$16.86	\$23.35

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :** 1 Journeymen to 2 Apprentice (Indentured After 9-4-2018)

**Jurisdiction ( \* denotes special jurisdictional note ) :** CLINTON, DARKE, GREENE, MIAMI, MONTGOMERY, PREBLE, WARREN\*

1 Journeymen to 2 Apprentice (Indentured Before 9--03-2018)

**Special Jurisdictional Note :** The following townships in Warren County are included: (Clearcreek, Franklin and Wayne)

**Details :** Work covered but not limited to: installation which utilize transmission and/or transference of voice, sound, vision or digital for commercial, education, security and entertainment purposes for the following:

TV monitoring and surveillance, background-foreground music, intercom and telephone interconnect, inventory control systems, microwave transmission, multimedia, multiplex, nurse call system, radio page, school intercom, sound and low voltage master clock systems.

Fire Alarm work is excluded on all new construction sites or wherever the fire alarm system is installed in conduit.

All HVAC control work is not covered by this wage rate but by the Inside Electrical wage rate.



# Prevailing Wage Rate Skilled Crafts

Name of Union: Elevator Local 11

**Change # : LCN01-2020fbLoc11**

**Craft : Elevator Effective Date : 01/05/2021 Last Posted : 01/05/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Elevator Mechanic	\$48.82		\$15.88	\$10.46	\$0.64	\$3.91	\$8.85	\$1.56	\$0.00	\$0.00	\$90.12	\$114.53
Probationary Apprentice	50.00	\$24.41	\$0.00	\$0.00	\$0.00	\$1.46	\$0.00	\$0.78	\$0.00	\$0.00	\$26.65	\$38.86
1st year	55.00	\$26.85	\$15.88	\$10.46	\$0.64	\$1.61	\$8.85	\$0.86	\$0.00	\$0.00	\$65.15	\$78.58
2nd year	65.00	\$31.73	\$15.88	\$10.46	\$0.64	\$1.90	\$8.85	\$1.02	\$0.00	\$0.00	\$70.48	\$86.35
3rd year	70.00	\$34.17	\$15.88	\$10.46	\$0.64	\$2.05	\$8.85	\$1.09	\$0.00	\$0.00	\$73.14	\$90.23
4th year	80.00	\$39.06	\$15.88	\$10.46	\$0.64	\$2.34	\$8.85	\$1.25	\$0.00	\$0.00	\$78.48	\$98.00
Helper	70.00	\$34.17	\$15.88	\$10.46	\$0.64	\$2.05	\$8.85	\$1.09	\$0.00	\$0.00	\$73.14	\$90.23
Assistant Mechanic	80.00	\$39.06	\$15.88	\$10.46	\$0.64	\$2.34	\$8.85	\$1.25	\$0.00	\$0.00	\$78.48	\$98.00

**Special Calculation Note :** Other is Holiday Pay. Vacation calculated at 6%.

**Ratio :** **Jurisdiction ( \* denotes special jurisdictional note ) :**

The total number of Helpers & Apprentices employed shall not exceed the number of Mechanics on any one job, except on jobs where (2) teams or more are working, (1) extra Helper or Apprentice may be employed for the first (2) teams and an extra Helper or Apprentice for each additional (3) teams.

ADAMS, BROWN, BUTLER, CLERMONT, CLINTON, DARKE, GREENE, HAMILTON, HIGHLAND, MIAMI, MONTGOMERY, PREBLE, SCIOTO, SHELBY, WARREN

- 1 Journeymen to 1 Apprentice
- 2 Journeymen to 5 Apprentice
- 3 Journeymen to 6 Apprentice

**Special Jurisdictional Note :**

**Details :**

# Prevailing Wage Rate Skilled Crafts

Name of Union: **Glazier Local 387**

**Change # : LCN01-2020fbLoc387**

**Craft : Glazier Effective Date : 11/01/2020 Last Posted : 10/28/2020**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Glazier	\$27.93		\$5.67	\$10.10	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.95	\$57.92
Apprentice	Percent											
1st 6 months	53.70	\$15.00	\$5.67	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$20.92	\$28.42
2nd 6 months	65.00	\$18.15	\$5.67	\$6.19	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$30.26	\$39.34
3rd 6 months	70.00	\$19.55	\$5.67	\$6.71	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$32.18	\$41.96
4th 6 months	75.00	\$20.95	\$5.67	\$6.85	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$33.72	\$44.19
5th 6 months	80.00	\$22.34	\$5.67	\$7.43	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$35.69	\$46.87
6th 6 months	85.00	\$23.74	\$5.67	\$7.57	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.23	\$49.10
7th 6 months	90.00	\$25.14	\$5.67	\$8.09	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.15	\$51.72
8th 6 months	95.00	\$26.53	\$5.67	\$8.68	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.13	\$54.40

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :**

Each employer may employ and train Apprentices in the following ratio to journeymen workers employed.  
1 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, BROWN, BUTLER, CHAMPAIGN, CLARK, CLERMONT, CLINTON, DARKE, FAYETTE\*, GREENE, HAMILTON, HIGHLAND, MIAMI, MONTGOMERY, PREBLE, SHELBY\*, WARREN

**Special Jurisdictional Note :** Fayette County: Eastern portion of route #41 being the dividing line between locals 372 and 387. Local 387 has jurisdiction of projects built on property which borders route #41 East.  
Shelby County: Southern portion of routes #47 & 29.

**Details :**

# Prevailing Wage Rate Skilled Crafts

Name of Union: **Ironworker Local 290**

**Change # : LCN01-2021fbLoc290**

**Craft : Ironworker Effective Date : 01/27/2021 Last Posted : 01/27/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Ironworker Structural	\$29.68		\$8.30	\$9.50	\$0.65	\$0.00	\$4.45	\$0.02	\$0.00	\$0.00	\$52.60	\$67.44
Welder	\$29.68		\$8.30	\$9.50	\$0.65	\$0.00	\$4.45	\$0.02	\$0.00	\$0.00	\$52.60	\$67.44
Fence Erector	\$29.68		\$8.30	\$9.50	\$0.65	\$0.00	\$4.45	\$0.02	\$0.00	\$0.00	\$52.60	\$67.44
Reinforcing Rods	\$29.68		\$8.30	\$9.50	\$0.65	\$0.00	\$4.45	\$0.02	\$0.00	\$0.00	\$52.60	\$67.44
Machinery Mover	\$29.68		\$8.30	\$9.50	\$0.65	\$0.00	\$4.45	\$0.02	\$0.00	\$0.00	\$52.60	\$67.44
Sheeter	\$29.68		\$8.30	\$9.50	\$0.65	\$0.00	\$4.45	\$0.02	\$0.00	\$0.00	\$52.60	\$67.44
Metal Building Erector	\$29.68		\$8.30	\$9.50	\$0.65	\$0.00	\$4.45	\$0.02	\$0.00	\$0.00	\$52.60	\$67.44
Rigger & Erector	\$29.68		\$8.30	\$9.50	\$0.65	\$0.00	\$4.45	\$0.02	\$0.00	\$0.00	\$52.60	\$67.44
<b>Apprentice</b>	<b>Percent</b>											
1st year	65.05	\$19.31	\$8.30	\$9.50	\$0.65	\$0.00	\$2.95	\$0.02	\$0.00	\$0.00	\$40.73	\$50.38
2nd year	75.07	\$22.28	\$8.30	\$9.50	\$0.65	\$0.00	\$2.95	\$0.02	\$0.00	\$0.00	\$43.70	\$54.84
3rd year	85.05	\$25.24	\$8.30	\$9.50	\$0.65	\$0.00	\$2.95	\$0.02	\$0.00	\$0.00	\$46.66	\$59.28
4th year	95.05	\$28.21	\$8.30	\$9.50	\$0.65	\$0.00	\$2.95	\$0.02	\$0.00	\$0.00	\$49.63	\$63.74

**Special Calculation Note :** Other is for Industry Fund.

**Ratio :**

3 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ALLEN\*, AUGLAIZE, BUTLER\*, CHAMPAIGN\*, CLARK, CLINTON, DARKE, FAYETTE\*, GREENE, HARDIN\*, HIGHLAND\*, LOGAN\*, MADISON\*, MERCER\*, MIAMI, MONTGOMERY, PREBLE, SHELBY, VAN WERT\*, WARREN\*

**Special Jurisdictional Note :** Allen County Twps included are: Auglaize, Perry, Shawnee, Amanda, Spencer, Marion, Sugar Creek, American, Bath, Jackson. Butler County Twps included are: Milford, Wayne, Madison, Lemon. Champaign Cnty Twps included are: Union, Urbana, Jackson, Concord, Salem, Mad River,

Johnson, Harrison, Adams. Fayette County Twps included are: Green, Jasper, Concord, Jefferson. Hardin County Twps included are: Round Head, Marion, Liberty. Highland County Twps included are: Fairfield, Penn, Union, Marshall, Liberty, Paint, Brush Creek. Logan County Twps included are: Richland, Stokes, Bloomfield, Washington, Harrison, McArthur, Lake, Liberty, Pleasant, Miami. Madison County Twps included are: Stokes. Mercer County Twps included are: Dublin, Washington, Jefferson, Recovery, Gibson, Union, Liberty, Butler, Granville, Center, Hopewell, Franklin, Marion. VanWert County Twps included are: Jennings. Warren County Twps included are: Franklin, Clear Creek, Turtle Creek, Wayne, Massie, Washington, Salem, Union.

### **Details :**

Structural Iron Work but not limited to:field fabrication, all loading to and including the erecting,rigging,assembly,dismantling, placing, temporary and permanent securing by any means of all structural iron,steel,ornamental lead,bronze,brass,copper,aluminum,glass all ferrous and non ferrous metal and composite material, precast prestressed and post-stressed concrete structures. Bridges and bridge rails,bridge viaducts,bucks bulkheads,bumper and bumper post,canopies and unistrut canopies,corrugated ferrous and non ferrous sheets when attached to steel frames,columns,beams,bar-joists,trusses,grinders,roof decking,electrical supports,elevator cars,elevator fronts and enclosures,erection of steel towers,flag poles, gymnasium equipment,stadium and arena seating,jail cell work,jail cell beds,benches,bunks,chairs,tables,mirrors,jail cell access doors,rigging and installation of machinery and equipment(erecting,aligning,anchoring and dismantling, erection and dismantling of tower cranes,derrick monorail systems, Chicago booms,overhead cranes,gantries,material and personnel hoists,tanks,hoppers and conveyors. All pre-engineered metal buildings and their entirety including siding,roofing, gutters, downspouts and erection of all.

Ornamental Iron Work but not limited to:all work in connection with field fabrication,handling including loading/off loading,sorting,cutting,fastening,anchoring,bending,hoisting,placing,burning,welding,and tying,dismantling of all materials used in miscellaneous iron or steel, for stairs,hand railings,rolling doors, rolling gates,rolling shutters,fence,windows,curtain wall,erection and welding of all metal, sash,architectural and ornamental treatments, but not necessarily limited to all sizes and types of ornamental,steel iron,lead,bronze,brass,copper,aluminum,all ferrous and non ferrous metals and composite materials

Fence Erector Iron Worker but not limited to: All work in connection with the field fabrication and erection of chain link fence,which includes but not limited to the loading and of the fence fabric and posts also the installation of the above.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Labor HevHwy 3

Change # : LCN01-2021fbLocalHevHwy3

Craft : Laborer Group 1 Effective Date : 05/01/2021 Last Posted : 04/21/2021

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Laborer Group 1	\$33.27		\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$45.22	\$61.86
Group 2	\$33.44		\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$45.39	\$62.11
Group 3	\$33.77		\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$45.72	\$62.61
Group 4	\$34.22		\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$46.17	\$63.28
Watch Person	\$26.00		\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$37.95	\$50.95
<b>Apprentice</b>	<b>Percent</b>											
0-1000 hrs	60.00	\$19.96	\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$31.91	\$41.89
1001-2000 hrs	70.00	\$23.29	\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$35.24	\$46.88
2001-3000 hrs	80.00	\$26.62	\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$38.57	\$51.87
3001-4000 hrs	90.00	\$29.94	\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$41.89	\$56.86
More than 4000 hrs	100.00	\$33.27	\$7.50	\$3.90	\$0.45	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$45.22	\$61.86

**Special Calculation Note :** Watchmen have no Apprentices. Tunnel Laborer rate with air-pressurized add \$1.00 to the above wage rate.

## Ratio :

1 Journeymen to 1 Apprentice  
3 Journeymen to 1 Apprentice thereafter

## Jurisdiction ( \* denotes special jurisdictional note ) :

ADAMS, ALLEN, ASHLAND, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, LOGAN, MADISON, MARION, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW,

MUSKINGUM, NOBLE, PAULDING, PERRY,  
PICKAWAY, PIKE, PREBLE, PUTNAM, RICHLAND,  
ROSS, SCIOTO, SENECA, SHELBY, TUSCARAWAS,  
UNION, VAN WERT, VINTON, WARREN,  
WASHINGTON, WAYNE, WILLIAMS, WYANDOT

**Special Jurisdictional Note :** Hod Carriers and Common Laborers - Heavy, Highway, Sewer, Waterworks, Utility, Airport, Railroad, Industrial and Building Site, Sewer Plant, Waste Water Treatment Facilities Construction

**Details :**

**Group 1**

Laborer (Construction); Plant Laborer or Yardman, Right-of-way Laborer, Landscape Laborer, Highway Lighting Worker, Signalization Worker, (Swimming) Pool Construction Laborer, Utility Man, \*Bridge Man, Handyman, Joint Setter, Flagperson, Carpenter Helper, Waterproofing Laborer, Slurry Seal, Seal Coating, Surface Treatment or Road Mix Laborer, Riprap Laborer & Grouter, Asphalt Laborer, Dump Man (batch trucks), Guardrail & Fence Installer, Mesh Handler & Placer, Concrete Curing Applicator, Scaffold Erector, Sign Installer, Hazardous Waste (level D), Diver Helper, Zone Person and Traffic Control.

\*Bridge Man will perform work as per the October 31, 1949, memorandum on concrete forms, by and between the United Brotherhood of Carpenters and Joiners of America and the Laborers' International Union of North America, which states in; "the moving, cleaning, oiling and carrying to the next point of erection, and the stripping of forms which are not to be re-used, and forms on all flat arch work shall be done by members of the Laborers' International Union of North America."

**Group 2**

Asphalt Raker, Screwman or Paver, Concrete Puddler, Kettle Man (pipeline), All Machine-Driven Tools (Gas, Electric, Air), Mason Tender, Brick Paver, Mortar Mixer, Skid Steer, Sheeting & Shoring Person, Surface Grinder Person, Screedperson, Water Blast, Hand Held Wand, Power Buggy or Power Wheelbarrow, Paint Striper, Plastic fusing Machine Operator, Rodding Machine Operator, Pug Mill Operator, Operator of All Vacuum Devices Wet or Dry, Handling of all Pumps 4 inches and under (gas, air or electric), Diver, Form Setter, Bottom Person, Welder Helper (pipeline), Concrete Saw Person, Cutting with Burning Torch, Pipe Layer, Hand Spiker (railroad), Underground Person (working in sewer and waterline, cleaning, repairing and reconditioning). Tunnel Laborer (without air), Caisson, Cofferdam (below 25 feet deep), Air Track and Wagon Drill, Sandblaster Nozzle Person, Hazardous Waste (level B), \*\*\*Lead Abatement, Hazardous Waste (level C)

\*\*\*Includes the erecting of structures for the removal, including the encapsulation and containment of Lead abatement process.

**Group 3**

Blast and Powder Person, Muckers will be defined as shovel men working directly with the miners, Wrencher (mechanical joints & utility pipeline), Yarnier, Top Lander, Hazardous Waste (level A), Concrete Specialist, Curb Setter and Cutter, Grade Checker, Concrete Crew in Tunnels. Utility pipeline Tappers, Waterline, Caulker, Signal Person will receive the rate equal to the rate paid the Laborer classification for which the Laborer is signaling.

**Group 4**

Miner, Welder, Gunitite Nozzle Person

A.) The Watchperson shall be responsible to patrol and maintain a safe traffic zone including but not limited to barrels, cones, signs, arrow boards, message boards etc.

The responsibility of a watchperson is to see that the equipment, job and office trailer etc. are secure.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Labor Local 1410 Building**

**Change # : LCN01-2021bLoc1410**

**Craft : Laborer Effective Date : 07/22/2021 Last Posted : 07/22/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Laborer Group 1	\$28.15		\$7.50	\$3.90	\$0.40	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$40.05	\$54.12
Group 2	\$28.75		\$7.50	\$3.90	\$0.40	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$40.65	\$55.03
Group 3	\$29.25		\$7.50	\$3.90	\$0.40	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$41.15	\$55.78
Apprentice	Percent											
Building Laborer 1-1000 hrs	60.00	\$16.89	\$7.50	\$3.90	\$0.40	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$28.79	\$37.23
1001-2000	70.02	\$19.71	\$7.50	\$3.90	\$0.40	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$31.61	\$41.47
2001-3000	80.00	\$22.52	\$7.50	\$3.90	\$0.40	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$34.42	\$45.68
3001-4000	90.00	\$25.33	\$7.50	\$3.90	\$0.40	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$37.24	\$49.90
More than 4000 hrs	100.00	\$28.15	\$7.50	\$3.90	\$0.40	\$0.00	\$0.00	\$0.00	\$0.10	\$0.00	\$40.05	\$54.12

**Special Calculation Note :** \$0.10 LECET is for Labor Management.

**Ratio :**

1 Journeymen to 1 Apprentice  
4 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

CHAMPAIGN, CLARK, DARKE, GREENE, LOGAN, MIAMI, MONTGOMERY, PREBLE

**Special Jurisdictional Note :**

**Details :**

Group 1  
Building & Construction Laborer, Railroad Laborer, Asbestos & Hazardous Waste (Levels A,B,C, & D), Concrete Crew, Form Setter, Pipelayer, Bottom Man, Burner (Cutting Torch), Welder Helper, All Machine & Power Driven Tools, Sandblaster  
Yardman-Landscaping, Sewer Jet, Waterperson, Tool Cage Laborer, Unloading Furniture & Fixtures, Final Clean-Up  
Watchman, Residential Construction, Signal Men

Group 2  
Mason Tender For Bricklayers, Flexcore, Firebrick Tender (Blast Furnaces, Soaking Pits, Stoves & Stacks), Plasterer  
Tenders & Lathers

### Group 3 Tender Operator

#### Asbestos, Lead and Hazardous Material:

The removal, abatement or encapsulation of asbestos, lead and/or toxic and hazardous waste or materials is defined as all work included in the erection, moving servicing and dismantling of all enclosures, scaffolding, barricades, etc. and the operation of all tools and equipment (including generators, compressors and vacuums) normally used in the removal or abatement or asbestos, lead and toxic and hazardous waste or materials; the labeling, bagging, cartoning, crating or otherwise packaging of materials for disposal; as well as the clean-up of the work site and all other work incidental to the removal, abatement or encapsulation of asbestos, lead or toxic and hazardous waste materials.

#### Level A

Protective equipment is required when the area has been determined to contain extremely toxic contaminants or contaminants unknown but may be expected to be extremely toxic and/or immediately dangerous to life and health. This ensemble includes a fully encapsulated chemical suit, self contained breathing apparatus (SCBA) or airline fed respirator, and various types and numbers of boots and gloves.

#### Level B

Protective equipment includes a chemically resistant splash suit and a SCBA or airline respirator. This ensemble is required when the situation is very hazardous, such as oxygen deficient atmospheres, IDLH atmospheres, or confined space entries.

#### Level C

Protective equipment includes a protective suit and an air purifying respirator (APR) with the appropriate filter canisters.

#### Level D

To be worn only in established "safe zones" may consist of, from normal work clothes to normal skin protection such as gloves, face shields goggles, coveralls and occasionally respiratory protection.



# Prevailing Wage Rate Skilled Crafts

**Name of Union: Operating Engineers - Building Local 18 - Zone III**

**Change # : LCN01-2021sksLoc18zone3**

**Craft : Operating Engineer Effective Date : 08/13/2021 Last Posted : 08/13/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Operator Group A	\$39.14		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$55.09	\$74.66
Operator Group B	\$39.02		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$54.97	\$74.48
Operator Group C	\$37.98		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$53.93	\$72.92
Operator Group D	\$36.80		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$52.75	\$71.15
Operator Group E	\$31.34		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$47.29	\$62.96
Master Mechanic	\$39.39		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$55.34	\$75.03
Cranes 150'-180'	\$39.64		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$55.59	\$75.41
Cranes 180'-249'	\$40.14		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$56.09	\$76.16
Cranes 249' and over	\$40.39		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$56.34	\$76.53
<b>Apprentice</b>	<b>Percent</b>											
1st Year	50.00	\$19.57	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$35.52	\$45.31
2nd Year	60.00	\$23.48	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$39.43	\$51.18
3rd Year	70.00	\$27.40	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$43.35	\$57.05
4th Year	80.00	\$31.31	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$47.26	\$62.92
Field Mechanic Trainee												
1st Year	50.00	\$19.57	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$35.52	\$45.31
2nd Year	60.00	\$23.48	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$39.43	\$51.18
3rd Year	70.00	\$27.40	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$43.35	\$57.05
4th Year	80.00	\$31.31	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$47.26	\$62.92

**Special Calculation Note : Other: Education & Safety \$0.09**

**Ratio :**

**Jurisdiction ( \* denotes special jurisdictional note**

For every (3) Operating Engineer Journeymen employed by the company there may be employed (1) Registered Apprentice or trainee Engineer through the referral when they are available. An apprentice, while employed as part of a crew per Article VIII, paragraph 78, will not be subject to the apprenticeship ratios in this collective bargaining agreement

ADAMS, ALLEN, ASHLAND, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, LOGAN, MADISON, MARION, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, TUSCARAWAS, UNION, VAN WERT, VINTON, WARREN, WASHINGTON, WAYNE, WILLIAMS, WYANDOT

### Special Jurisdictional Note :

#### Details :

Note: There will be a 10% increase for the apprentices on top of the percentages listed above provided they are operating mobile equipment. Mechanic Trainees will receive 10% increase if required to have CDL

Group A- Barrier Moving Machines; Boiler Operators or Compressor Operators, when compressor or boiler is mounted on crane (Piggyback Operation); Boom Trucks (all types); Cableways Cherry Pickers; Combination - Concrete Mixers & Towers; All Concrete Pumps with Booms; Cranes (all types); Compact Cranes, track or rubber over 4,000 pounds capacity; Cranes self-erecting, stationary, track or truck (all configurations); Derricks (all types); Draglines; Dredges (dipper, clam or suction) 3-man crew; Elevating Graders or Euclid Loaders; Floating Equipment; Forklift (rough terrain with winch/hoist); Gradalls; Helicopter Operators, hoisting building materials; Helicopter Winch Operators, Hoisting building materials; Hoes (All types); Hoists (with two or more drums in use); Horizontal Directional Drill; Hydraulic Gantry (lift system); Laser Finishing Machines; Laser Screed and like equipment; Lift Slab or Panel Jack Operators; Locomotives (all types); Maintenance Operator/Technician(Mechanic Operator/Technician and/or Welder); Mixers, paving (multiple drum); Mobile Concrete Pumps, with booms; Panelboards, (all types on site); Pile Drivers; Power Shovels; Prentice Loader; Rail Tamper (with automatic lifting and aligning device); Rotary Drills (all), used on caissons for foundations and sub-structure; Side Booms; Slip Form Pavers; Straddle Carriers (Building Construction on site); Trench Machines (over 24" wide); Tug Boats.

Group B - Articulating/end dumps (minus \$4.00/hour from Group B rate); Asphalt Pavers; Bobcat-type and/or skid steer loader with hoe attachment greater than 7000 lbs.; Bulldozers; CMI type Equipment; Concrete Saw, Vermeer-type; Endloaders; Hydro Milling Machine; Kolman-type Loaders (Dirt Loading); Lead Greasemen; Mucking Machines; Pettibone-Rail Equipment; Power Graders; Power Scoops; Power Scrapers; Push Cats;, Rotomills (all), grinders and planers of all types.

Group C - A-Frames; Air Compressors, Pressurizing Shafts or Tunnels; All Asphalt Rollers; Bobcat-type and/or Skid Steer Loader with or without attachments; Boilers (15 lbs. pressure and over); All Concrete Pumps (without booms with 5 inch system); Fork Lifts (except masonry); Highway Drills - all types (with integral power); Hoists (with one drum); House Elevators (except those automatic call button controlled), Buck Hoists, Transport Platforms, Construction Elevators; Hydro Vac/Excavator (when a second person is needed, the rate of pay will be "Class E"); Man Lifts; Material hoist/elevators; Mud Jacks; Pressure Grouting; Pump Operators (installing or operating Well Points or other types of Dewatering Systems); Pumps (4 inches and over discharge); Railroad Tie (Inserter/Remover); Rotovator (Lime-Soil Stabilizer); Submersible Pumps (4"and over discharge); Switch & Tie Tampers (without lifting and aligning

device); Trench Machines (24" and under); Utility Operators.

Group D - Backfillers and Tampers; Ballast Re-locator; Batch Plant Operators; Bar and Joint Installing Machines; Bull Floats; Burlap and Curing Machines; Clefplanes; Compressors, on building construction; Concrete Mixers, more than one bag capacity; Concrete Mixers, one bag capacity (side loaders); All Concrete Pumps (without boom with 4" or smaller system); Concrete Spreader; Conveyors, used for handling building materials; Crushers; Deckhands; Drum Fireman (in asphalt plants); Farm type tractors pulling attachments; Finishing Machines; Form Trenchers; Generators; Gunite Machines; Hydro-seeders; Pavement Breakers (hydraulic or cable); Post Drivers; Post Hole Diggers; Pressure Pumps (over 1/2" discharge); Road Widening Trenchers; Rollers (except asphalt); Self-propelled sub-graders; Shotcrete Machines; Tire Repairmen; Tractors, pulling sheepsfoot post roller or grader; VAC/ALLS; Vibratory Compactors, with integral power; Welders.

Group E – Allen Screed Paver (concrete); Boilers (less than 15 lbs. pressure); Cranes-Compact, track or rubber (under 4,000 pounds capacity); Directional Drill "Locator"; Fueling and greasing +\$3.00; Inboard/outboard Motor Boat Launches; Light Plant Operators; Masonry Fork Lifts; Oilers/Helpers; Power Driven Heaters (oil fired); Power Scrubbers; Power Sweepers; Pumps (under 4 inch discharge); Signalperson, Submersible Pumps (under 4" discharge).

Master Mechanics - Master Mechanic

Cranes 150' – 180' - Boom & Jib 150 - 180 feet

Cranes 180' – 249' - Boom & Jib 180 - 249 feet

Cranes 250' and over - Boom & Jib 250-feet or over

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Operating Engineers - HevHwy Zone II**

**Change # : LCN01-2021sksLoc18hevhwyl**

**Craft : Operating Engineer Effective Date : 08/13/2021 Last Posted : 08/13/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Operator Class A	\$39.14		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$55.09	\$74.66
Operator Class B	\$39.02		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$54.97	\$74.48
Operator Class C	\$37.98		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$53.93	\$72.92
Operator Class D	\$36.80		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$52.75	\$71.15
Operator Class E	\$31.34		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$47.29	\$62.96
Master Mechanic	\$39.39		\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$55.34	\$75.03
<b>Apprentice</b>	<b>Percent</b>											
1st Year	50.00	\$19.57	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$35.52	\$45.31
2nd Year	60.00	\$23.48	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$39.43	\$51.18
3rd Year	70.00	\$27.40	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$43.35	\$57.05
4th Year	80.00	\$31.31	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$47.26	\$62.92
Field Mech Trainee Class 2												
1st year	50.00	\$19.57	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$35.52	\$45.31
2nd year	60.00	\$23.48	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$39.43	\$51.18
3rd year	70.00	\$27.40	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$43.35	\$57.05
4th year	80.00	\$31.31	\$8.76	\$6.25	\$0.85	\$0.00	\$0.00	\$0.09	\$0.00	\$0.00	\$47.26	\$62.92

**Special Calculation Note :** Other: Education & Safety Fund is \$0.09 per hour.

**Ratio :**

For every (3) Operating Engineer Journeymen employed by the company, there may be employed (1) Registered Apprentice or Trainee Engineer through the referral when they are available. An Apprentice, while employed as part of a crew per Article VIII, paragraph 65 will not be subject

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ALLEN, ASHLAND, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN,

to the apprenticeship ratios in this collective bargaining agreement

FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, LOGAN, LUCAS, MADISON, MARION, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, TUSCARAWAS, UNION, VAN WERT, VINTON, WARREN, WASHINGTON, WAYNE, WILLIAMS, WOOD, WYANDOT

## Special Jurisdictional Note :

### Details :

\*\*Apprentices will receive a 10% increase on top of the percentages listed above provided they are operating mobile equipment. Mechanic Trainees will receive 10% increase if they are required to have CDL.

Class A - Air Compressors on Steel Erection; Asphalt Plant Engineers (Cleveland District Only); Barrier Moving Machine; Boiler Operators, Compressor Operators, or Generators, when mounted on a rig; Boom Trucks (all types); Cableways; Cherry Pickers; Combination- Concrete Mixers & Towers; Concrete Plants (over 4 yd capacity); Concrete Pumps; Cranes (all types); Compact Cranes track or rubber over 4,000 pounds capacity; Cranes self-erecting stationary, track or truck; Derricks (all types); Draglines; Dredges dipper, clam or suction; Elevating Graders or Euclid Loaders; Floating Equipment (all types); Gradalls; Helicopter Crew (Operator- hoist or winch); Hoes (all types); Hoisting Engines; Hoisting Engines, on shaft or tunnel work; Hydraulic Gantry (lifting system); Industrial-type Tractors; Jet Engine Dryer (D8 or D9) diesel Tractors; Locomotives (standard gauge); Maintenance Operators/Technicians (class A); Mixers, paving (single or double drum); Mucking Machines; Multiple Scrapers; Piledriving Machines (all types); Power Shovels, Prentice Loader; Quad 9 (double pusher); Rail Tamper (with automatic lifting and aligning device); Refrigerating Machines (freezer operation); Rotary Drills, on caisson work; Rough Terrain Fork Lift with winch/hoist; Side Booms; Slip Form Pavers; Survey Crew Party Chiefs; Tower Derricks; Tree Shredders; Trench Machines (over 24" wide); Truck Mounted Concrete Pumps; Tug Boats; Tunnel Machines and /or Mining Machines; Wheel Excavators.

Class B - Asphalt Pavers; Automatic Subgrade Machines, self-propelled (CMI-type); Bobcat-type and /or Skid Steer Loader with hoe attachment greater than 7000 lbs.; Boring Machine Operators (more than 48 inches); Bulldozers; Concrete Saws, Vermeer type; Endloaders; Horizontal Directional Drill (50,000 ft. lbs. thrust and over); Hydro Milling Machine; Kolman-type Loaders (production type-dirt); Lead Greasemen; Lighting and Traffic Signal Installation Equipment includes all groups or classifications; Maintenance Operators/Technicians, Class B; Material Transfer Equipment (shuttle buggy) Asphalt; Pettibone-Rail Equipment; Power Graders; Power Scrapers; Push Cats; Rotomills (all), Grinders and Planners of all types, Groovers (excluding walk-behinds); Trench Machines (24 inch wide and under).

Class C - A-Frames; Air Compressors, on tunnel work (low Pressure); Articulating/straight bed end dumps if assigned (minus \$4.00 per hour); Asphalt Plant Engineers (Portage and Summit Counties only); Bobcat-type and/or skid steer loader with or without attachments; Drones; Highway Drills (all types); HydroVac/Excavator (when a second person is needed, the rate of pay will be "Class E"); Locomotives (narrow gauge); Material Hoist/Elevators; Mixers, concrete (more than one bag capacity); Mixers, one bag capacity (side loader); Power Boilers (over 15 lbs. pressure); Pump Operators (installing or operating well Points); Pumps (4 inch and over discharge); Railroad Tie Inserter/Remover; Rollers, Asphalt; Rotovator (lime-soil Stabilizer); Switch & Tie Tampers (without lifting and aligning device); Utilities Operators, (small equipment); Welding Machines and Generators.

Class D – Backfillers and Tampers; Ballast Re-locator; Bar and Joint Installing Machines; Batch Plant Operators; Boring Machine Operators (48 inch or less); Bull Floats; Burlap and Curing Machines; Concrete Plants (capacity 4 yds.

and under); Concrete Saws (multiple); Conveyors (highway); Crushers; Deckhands; Farm type tractors, with attachments (highway); Finishing Machines; Firemen, Floating Equipment (all types); Fork Lifts (highway), except masonry; Form Trenchers; Hydro Hammers; Hydro Seeders; Pavement Breakers (hydraulic or cable); Plant Mixers; Post Drivers; Post Hole Diggers; Power Brush Burners; Power Form Handling Equipment; Road Widening Trenchers; Rollers (brick, grade, macadam); Self-Propelled Power Spreaders; Self-Propelled Sub-Graders; Steam Firemen; Survey Instrument men; Tractors, pulling sheepsfoot rollers or graders; Vibratory Compactors, with integral power.

Class E - Compressors (portable, Sewer, Heavy and Highway); Cranes-Compact, track or rubber under 4,000 pound capacity; Drum Firemen (asphalt plant); Fueling and greasing (Primary Operator with Specialized CDL Endorsement Add \$3.00/hr); Generators; Inboard-Outboard Motor Boat Launches; Masonry Fork Lifts; Oil Heaters (asphalt plant); Oilers/Helpers; Power Driven Heaters (oil fired); Power Scrubbers; Power Sweepers; Pumps (under 4 inch discharge); Signalperson; Survey Rodmen or Chairmen; Tire Repairmen; VAC/ALLS.  
Master Mechanic - Master Mechanic

# Prevailing Wage Rate Skilled Crafts

Name of Union: Painter Local 249

**Change # : LCR01-2021sksLoc249**

**Craft : Drywall Finisher Effective Date : 12/16/2021 Last Posted : 12/16/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Painter Drywall Finisher	\$25.17		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.17	\$49.76
<b>Apprentice Percent</b>												
30 Day Probationary	50.00	\$12.59	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$19.39	\$25.68
1st Year	65.00	\$16.36	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$23.16	\$31.34
2nd Year	65.00	\$16.36	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$23.16	\$31.34
3rd Year	75.00	\$18.88	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$25.68	\$35.12
4th Year	85.00	\$21.39	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$28.19	\$38.89

**Special Calculation Note :**

**Ratio :**

1 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

CLARK, DARKE, GREENE, MIAMI, MONTGOMERY, PREBLE

**Special Jurisdictional Note :**

**Details :**

Industrial work but not limited to:work done on industrial plants, repair garages, processing plants,storage tanks, warehouses, skeleton structures,bridges,whether new or old construction, office buildings in industrial sites and interior of shopping malls.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Painter Local 249

**Change # : LCR01-2021sksLoc249**

**Craft : Painter Effective Date : 12/16/2021 Last Posted : 12/16/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Painter Brush Roll	\$24.92		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$36.92	\$49.38
Paper Hanger	\$24.92		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$36.92	\$49.38
Spray Commercial	\$24.92		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$36.92	\$49.38
Spray Industrial	\$24.92		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$36.92	\$49.38
Sandblasting, Steam Cleaning-Lead Abatment	\$25.67		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.67	\$50.51
Special Coating (Coal Tar) Spray Applied	\$26.42		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$38.42	\$51.63
Steeplejack Work	\$25.87		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.87	\$50.81
Elevated Tanks	\$28.56		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$40.56	\$54.84
Water Blasting	\$25.67		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.67	\$50.51
Apprentice	Percent											
30 Day Probationary	50.00	\$12.46	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$19.26	\$25.49
1st Year	65.00	\$16.20	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$23.00	\$31.10
2nd Year	65.00	\$16.20	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$23.00	\$31.10
3rd Year	75.00	\$18.69	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$25.49	\$34.84
4th Year	85.00	\$21.18	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$27.98	\$38.57

**Special Calculation Note :**

**Ratio :**

**Jurisdiction ( \* denotes special jurisdictional note**



1 Journeymen to 1 Apprentice

):  
CLARK, DARKE, GREENE, MIAMI, MONTGOMERY,  
PREBLE

**Special Jurisdictional Note :**

**Details :**

Industrial work but not limited to:work done on industrial plants, repair garages, processing plants,storage tanks, warehouses, skeleton structures,bridges,whether new or old construction, office buildings in industrial sites and interior of shopping malls.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Painter Local 249 HevHwy

**Change # : LCR01-2021sksLoc249**

**Craft : Painter Effective Date : 12/16/2021 Last Posted : 12/16/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Painter Bridge Blaster Class 1	\$36.63		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$48.63	\$66.95
Bridge Painter, Rigger, Containment Builder, Spot Blaster Class 2	\$33.63		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.63	\$62.45
Equipment Operator/Field Mechanic, Grit Reclamation, Paint Mixer, Traffic Control, Boat Person, Driver Class 3	\$31.63		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.63	\$59.45
Concrete Sealing, Concrete Blasting/Power Washing/Etc. Class 4	\$29.63		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.63	\$56.45
Quality Control/Quality Assurance, Traffic safety, Competent Person Class 5	\$29.63		\$5.77	\$5.95	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.63	\$56.45
<b>Apprentice</b>	<b>Percent</b>											
30 day Probationary	50.00	\$18.32	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$25.12	\$34.27
1st Year	65.00	\$23.81	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$30.61	\$42.51
2nd Year	65.00	\$23.81	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$30.61	\$42.51
3rd Year	75.00	\$27.47	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.27	\$48.01
4th Year	85.00	\$31.14	\$5.77	\$0.75	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.94	\$53.50

**Special Calculation Note :**

**Ratio :**

1 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

CLARK, DARKE, GREENE, MIAMI, MONTGOMERY, PREBLE

**Special Jurisdictional Note :**

**Details :**

# Prevailing Wage Rate Skilled Crafts

Name of Union: Painter Local 639

**Change # : LCNO1-2015fbLoc639**

**Craft : Painter Effective Date : 06/10/2015 Last Posted : 06/10/2015**

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Painter Metal Finisher/Helpers											
Top Helper Class A	\$19.09	\$3.65	\$0.00	\$0.00	\$0.66	\$0.00	\$0.00	\$0.00	\$0.00	\$23.40	\$32.94
Top Helper Class B	\$19.09	\$3.65	\$0.65	\$0.00	\$1.03	\$0.00	\$0.37	\$0.00	\$0.00	\$24.79	\$34.33
Top Helper Class C	\$19.09	\$3.65	\$1.00	\$0.00	\$1.76	\$0.00	\$0.37	\$0.00	\$0.00	\$25.87	\$35.41
Helper Class A	\$14.69	\$3.65	\$0.00	\$0.00	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$18.85	\$26.19
Helper Class B	\$14.69	\$3.65	\$0.65	\$0.00	\$0.79	\$0.00	\$0.28	\$0.00	\$0.00	\$20.06	\$27.40
Helper Class C	\$14.69	\$3.65	\$1.00	\$0.00	\$1.64	\$0.00	\$0.28	\$0.00	\$0.00	\$21.26	\$28.60
New Hire 90 Days	\$11.00	\$3.65	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$14.65	\$20.15

**Special Calculation Note : Other is Sick and Personal Time**

**Ratio :**

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, CUYAHOGA, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GEAUGA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAKE, LAWRENCE, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, SUMMIT, TRUMBULL,

TUSCARAWAS, UNION, VAN WERT, VINTON,  
WARREN, WASHINGTON, WAYNE, WILLIAMS,  
WOOD, WYANDOT

## **Special Jurisdictional Note :**

### **Details :**

Top Helper: Shall perform the responsibilities of a Helper and be responsible for the setup, break down, safety and quality of the company's product.

Helper : Shall be responsible for performing tasks in refinishing, compliance with safety procedures, setting up and breaking down job sites, scaffolding and swing stages and preparing surfaces for refinishing including but not limited to, masking and stripping and cleaning, oxidizing, polishing and scratch removal on various surfaces

Class A Workers: Less than 1 Year of Service.

Class B Workers: More than 1 and less than 8 Years of Service.

Class C Workers: More than 8 Years of Service.

Metal Polisher Scope of Work: Polishing, buffing, stripping, coloring, lacquering, spraying, cleaning and maintenance of ornamental and architectural metals, iron, bronze, nickel, aluminum and stainless steel and in mental specialty work, various stone finishes, stone specialty work and any other work pertaining to the finishing of metal, stones, woods, and any window washing/cleaning done in conjunction with this work, using chemicals, solvents, coatings and hand applied lacquer thinner, removing scratches from mirror finished metals, burnishing of bronze, statuary finishes on exterior and interior surfaces and the use of all tools required to perform such work, including but not limited to polishes, spray equipment and scaffolding.

Swing State Rate: All work on scaffold 4 sections or higher, including any boom lifts and swing stage scaffolds including the rigging and derigging of hanging/suspended swing stage systems and rappelling/bolson chair work, ADD \$1.50 per hour.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Painter Local 639 Zone 2 Sign

Change # : LCN01-2016fbLoc639

Craft : Painter Effective Date : 08/03/2016 Last Posted : 08/03/2016

	BHR	Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
		H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification											
Painter Sign Journeyman Tech/Team Leader Class A	\$21.25	\$1.33	\$0.14	\$0.00	\$0.00	\$0.00	\$0.57	\$0.00	\$0.00	\$23.29	\$33.92
Painter Sign Journeyman Tech/Team Leader Class B	\$21.25	\$1.33	\$0.14	\$0.00	\$0.41	\$0.00	\$0.57	\$0.00	\$0.00	\$23.70	\$34.32
Painter Sign Journeyman Tech/Team Leader Class C	\$21.25	\$1.33	\$0.14	\$0.00	\$0.82	\$0.00	\$0.57	\$0.00	\$0.00	\$24.11	\$34.74
Painter Sign Journeyman Tech/Team Leader Class D	\$21.25	\$1.33	\$0.14	\$0.00	\$1.23	\$0.00	\$0.57	\$0.00	\$0.00	\$24.52	\$35.14
Sign Journeyman Class A	\$20.98	\$1.33	\$0.14	\$0.00	\$0.00	\$0.00	\$0.56	\$0.00	\$0.00	\$23.01	\$33.50
Sign Journeyman Class B	\$20.98	\$1.33	\$0.14	\$0.00	\$0.40	\$0.00	\$0.56	\$0.00	\$0.00	\$23.41	\$33.90
Sign Journeyman Class C	\$20.98	\$1.33	\$0.14	\$0.00	\$0.81	\$0.00	\$0.56	\$0.00	\$0.00	\$23.82	\$34.31
Sign Journeyman Class D	\$20.98	\$1.33	\$0.14	\$0.00	\$1.21	\$0.00	\$0.56	\$0.00	\$0.00	\$24.22	\$34.71
Tech Sign Fabrication/ Erector Class A	\$15.90	\$1.33	\$0.14	\$0.00	\$0.00	\$0.00	\$0.43	\$0.00	\$0.00	\$17.80	\$25.75
Tech Sign	\$15.90	\$1.33	\$0.14	\$0.00	\$0.31	\$0.00	\$0.43	\$0.00	\$0.00	\$18.11	\$26.06

Fabrication/ Erector Class B											
Tech Sign Fabrication/ Erector Class C	\$15.90	\$1.33	\$0.14	\$0.00	\$0.61	\$0.00	\$0.43	\$0.00	\$0.00	\$18.41	\$26.36
Tech Sign Fabrication/ Erector Class D	\$15.90	\$1.33	\$0.14	\$0.00	\$0.92	\$0.00	\$0.43	\$0.00	\$0.00	\$18.72	\$26.67

**Special Calculation Note :** Other is for paid holidays.

**Ratio :**

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ALLEN, AUGLAIZE, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GREENE, HAMILTON, HANCOCK, HARDIN, HENRY, HIGHLAND, HOLMES, HURON, JACKSON, KNOX, LICKING, LOGAN, LORAIN, LUCAS, MADISON, MAHONING, MARION, MERCER, MIAMI, MONTGOMERY, MORROW, MUSKINGUM, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PREBLE, PUTNAM, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, TRUMBULL, TUSCARAWAS, UNION, VAN WERT, WARREN, WAYNE, WILLIAMS, WOOD, WYANDOT

**Special Jurisdictional Note :**

**Details :**

- Class A: less that 1 year.
- Class B: 1-3 years.
- Class C; 3-10 years.
- Class D: More than 10 years.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Plasterer Local 132 (Dayton)

**Change # : LCN01-2021fbLoc132**

**Craft : Plaster Effective Date : 05/26/2021 Last Posted : 05/26/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Plasterer	\$24.50		\$7.60	\$7.15	\$0.70	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$43.20	\$55.45
<b>Apprentice</b>	<b>Percent</b>											
1st 6 months	60.00	\$14.70	\$7.60	\$7.15	\$0.70	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$33.40	\$40.75
2nd 6 months	65.00	\$15.93	\$7.60	\$7.15	\$0.70	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$34.63	\$42.59
3rd 6 months	70.00	\$17.15	\$7.60	\$7.15	\$0.70	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$35.85	\$44.42
4th 6 months	75.00	\$18.37	\$7.60	\$7.15	\$0.70	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$37.08	\$46.26
5th 6 months	80.00	\$19.60	\$7.60	\$7.15	\$0.70	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$38.30	\$48.10
6th 6 months	85.00	\$20.82	\$7.60	\$7.15	\$0.70	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$39.53	\$49.94
7th 6 months	90.00	\$22.05	\$7.60	\$7.15	\$0.70	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$40.75	\$51.78
8th 6 months	95.00	\$23.27	\$7.60	\$7.15	\$0.70	\$0.00	\$3.25	\$0.00	\$0.00	\$0.00	\$41.98	\$53.61

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :**

3 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ):**

CHAMPAIGN, CLARK, CLINTON, DARKE, GREENE, MIAMI, MONTGOMERY, PREBLE, SHELBY

**Special Jurisdictional Note :**

**Details :**

OTHER IS:Industry Fund



# Prevailing Wage Rate Skilled Crafts

Name of Union: **Plumber Pipefitter Local 162**

**Change # : LCRO1-2021fbLoc162**

**Craft : Plumber/Pipefitter Effective Date : 06/24/2021 Last Posted : 06/24/2021**

	BHR		Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
<b>Classification</b>												
Plumber Pipefitter	\$33.40		\$11.50	\$10.62	\$0.90	\$0.00	\$3.35	\$0.72	\$0.00	\$0.00	\$60.49	\$77.19
<b>Apprentice Indentured AFTER 6/1/2002</b>												
	<b>Percent</b>											
1st Year	50.00	\$16.70	\$11.50	\$3.19	\$0.90	\$0.00	\$0.00	\$0.72	\$0.00	\$0.00	\$33.01	\$41.36
2nd Year	55.00	\$18.37	\$11.50	\$4.25	\$0.90	\$0.00	\$1.34	\$0.72	\$0.00	\$0.00	\$37.08	\$46.27
3rd Year	60.00	\$20.04	\$11.50	\$6.37	\$0.90	\$0.00	\$2.01	\$0.72	\$0.00	\$0.00	\$41.54	\$51.56
4th Year	70.00	\$23.38	\$11.50	\$8.50	\$0.90	\$0.00	\$2.68	\$0.72	\$0.00	\$0.00	\$47.68	\$59.37
5th Year	80.00	\$26.72	\$11.50	\$10.62	\$0.90	\$0.00	\$3.35	\$0.72	\$0.00	\$0.00	\$53.81	\$67.17

**Special Calculation Note :** Other is for Training & Promotion Fund.

**Ratio :**

- 1 Journeyman to 1 Apprentice
- 2 - 4 Journeymen to 2 Apprentices
- 5 - 7 Journeymen to 3 Apprentices
- 8 - 10 Journeymen to 4 Apprentices

**Jurisdiction ( \* denotes special jurisdictional note ) :**

CHAMPAIGN, CLARK, CLINTON, DARKE, FAYETTE, GREENE, MIAMI, MONTGOMERY, PREBLE

**Special Jurisdictional Note :**

**Details :**

Wage rate covers: all plumbing, pipefitting, heating, refrigeration and air conditioning work.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Roofer Local 75

**Change # : LCN01-2021fbLoc75**

**Craft : Roofer Effective Date : 06/09/2021 Last Posted : 06/09/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Roofer	\$24.38		\$8.58	\$8.78	\$0.66	\$0.00	\$0.00	\$1.80	\$0.00	\$0.00	\$44.20	\$56.39
Slate and Tile	\$24.60		\$8.58	\$8.78	\$0.66	\$0.00	\$0.00	\$1.80	\$0.00	\$0.00	\$44.42	\$56.72
<b>Apprentice</b>												
	<b>Percent</b>											
1st term 1000 hrs	50.00	\$12.19	\$2.50	\$0.50	\$0.66	\$0.00	\$0.00	\$1.80	\$0.00	\$0.00	\$17.65	\$23.75
2nd term 1000 hrs	55.00	\$13.41	\$8.58	\$1.32	\$0.66	\$0.00	\$0.00	\$1.80	\$0.00	\$0.00	\$25.77	\$32.47
3rd term 1000 hrs	60.00	\$14.63	\$8.58	\$2.20	\$0.66	\$0.00	\$0.00	\$1.80	\$0.00	\$0.00	\$27.87	\$35.18
4th term 1000 hrs	70.00	\$17.07	\$8.58	\$3.07	\$0.66	\$0.00	\$0.00	\$1.80	\$0.00	\$0.00	\$31.18	\$39.71
5th term 1000 hrs	80.00	\$19.50	\$8.58	\$3.95	\$0.66	\$0.00	\$0.00	\$1.80	\$0.00	\$0.00	\$34.49	\$44.25
Tradesman	79.00	\$19.26	\$5.00	\$1.58	\$0.66	\$0.00	\$0.00	\$1.80	\$0.00	\$0.00	\$28.30	\$37.93

**Special Calculation Note :** Other is for National Roofing Industry Pension Plan.

**Ratio :**

3 Journeymen to 2 Apprentices

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ALLEN, AUGLAIZE, CLARK, CLINTON, DARKE, GREENE, MERCER, MIAMI, MONTGOMERY, PREBLE, SHELBY, VAN WERT

**Special Jurisdictional Note :**

**Details :**

# Prevailing Wage Rate Skilled Crafts

Name of Union: Sheet Metal Local 24 (Dayton)

**Change # : LCR01-2021fbLoc24(Day)**

**Craft : Sheet Metal Worker Effective Date : 07/14/2021 Last Posted : 07/14/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Sheet Metal Worker	\$29.30		\$9.00	\$15.00	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$54.15	\$68.80
Apprentice	Percent											
Apprentice												
5th Year B	85.00	\$24.91	\$8.76	\$11.51	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.03	\$58.48
5th Year A	80.00	\$23.44	\$8.68	\$10.35	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.32	\$55.04
4th Year B	75.00	\$21.98	\$8.60	\$9.18	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$40.61	\$51.59
4th Year A	70.00	\$20.51	\$8.52	\$8.03	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.91	\$48.17
3rd year B	65.00	\$19.05	\$8.45	\$6.85	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$35.20	\$44.72
3rd Year A	60.00	\$17.58	\$8.37	\$5.69	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$32.49	\$41.28
2 Year B	57.52	\$16.85	\$8.33	\$5.11	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$31.14	\$39.57
2 Year A	55.00	\$16.12	\$8.29	\$4.52	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$29.78	\$37.83
Probationary 1 Year	52.50	\$15.38	\$8.25	\$3.95	\$0.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$28.43	\$36.12

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :**

1 Journeyman to 1 Apprentice then,  
1 Apprentice for every 2 Journeymen thereafter

**Jurisdiction ( \* denotes special jurisdictional note ):**

ALLEN, AUGLAIZE, BUTLER, CHAMPAIGN, CLARK, CLINTON, DARKE, GREENE, HARDIN, LOGAN, MERCER, MIAMI, MONTGOMERY, PREBLE, SHELBY, VAN WERT, WARREN, WYANDOT

**Special Jurisdictional Note :**

**Details :**

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Sprinkler Fitter Local 669**

**Change # : LCN01-2021fbLoc669**

**Craft : Sprinkler Fitter Effective Date : 04/01/2021 Last Posted : 03/31/2021**

	BHR		Fringe Benefit Payments						Irrevocable Fund		Total PWR	Overtime Rate
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)	MISC (*)		
Classification												
Sprinkler Fitter	\$41.87		\$10.55	\$7.00	\$0.52	\$0.00	\$5.12	\$0.10	\$0.00	\$0.00	\$65.16	\$86.09
Apprentice Indentured after April 1, 2013	Percent											
CILASS 1	45.00	\$18.84	\$7.75	\$0.00	\$0.52	\$0.00	\$0.00	\$0.10	\$0.00	\$0.00	\$27.21	\$36.63
CLASS 2	50.00	\$20.93	\$7.75	\$0.00	\$0.52	\$0.00	\$0.00	\$0.10	\$0.00	\$0.00	\$29.30	\$39.77
CLASS 3	54.40	\$22.78	\$10.55	\$7.00	\$0.52	\$0.00	\$1.15	\$0.10	\$0.00	\$0.00	\$42.10	\$53.49
CLASS 4	59.40	\$24.87	\$10.55	\$7.00	\$0.52	\$0.00	\$1.15	\$0.10	\$0.00	\$0.00	\$44.19	\$56.63
CLASS 5	64.42	\$26.97	\$10.55	\$7.00	\$0.52	\$0.00	\$1.40	\$0.10	\$0.00	\$0.00	\$46.54	\$60.03
CLASS 6	69.40	\$29.06	\$10.55	\$7.00	\$0.52	\$0.00	\$1.40	\$0.10	\$0.00	\$0.00	\$48.63	\$63.16
CLASS 7	74.40	\$31.15	\$10.55	\$7.00	\$0.52	\$0.00	\$1.40	\$0.10	\$0.00	\$0.00	\$50.72	\$66.30
CLASS 8	79.42	\$33.25	\$10.55	\$7.00	\$0.52	\$0.00	\$1.40	\$0.10	\$0.00	\$0.00	\$52.82	\$69.45
CLASS 9	84.40	\$35.34	\$10.55	\$7.00	\$0.52	\$0.00	\$1.40	\$0.10	\$0.00	\$0.00	\$54.91	\$72.58
CLASS 10	89.40	\$37.43	\$10.55	\$7.00	\$0.52	\$0.00	\$1.40	\$0.10	\$0.00	\$0.00	\$57.00	\$75.72

**Special Calculation Note : \$0.10 for Other is National Fire Sprinkler Association**

**Ratio :**

1 Journeyman to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, LOGAN, LUCAS, MADISON, MAHONING, MARION, MEDINA, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW,

MUSKINGUM, NOBLE, OTTAWA, PAULDING,  
PERRY, PICKAWAY, PIKE, PORTAGE, PREBLE,  
PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO,  
SENECA, SHELBY, STARK, SUMMIT, TRUMBULL,  
TUSCARAWAS, UNION, VAN WERT, VINTON,  
WARREN, WASHINGTON, WAYNE, WILLIAMS,  
WOOD, WYANDOT

**Special Jurisdictional Note :**

**Details :**

Sprinkler Fitter work shall consist of the installation, dismantling, maintenance, repairs, adjustments, and corrections of all fire protection and fire control systems including the unloading, handling by hand, power equipment and installation of all piping or tubing, appurtenances and equipment pertaining thereto, including both overhead and underground water mains, fire hydrants and hydrant mains, standpipes and hose connections to sprinkler systems used in connection with sprinkler and alarm systems. Also all tanks and pumps connected thereto, also included shall be CO-2 and Cardox Systems, Dry Chemical Systems, Foam Systems and all other fire protection systems.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Truck Driver Bldg & HevHwy Class 1**  
**Locals 20,40,92,92b,100,175,284,438,377,637,908,957**

**Change # : LCRO1-2021fbBldgHevHwy**

**Craft : Truck Driver Effective Date : 05/21/2021 Last Posted : 05/21/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Truck Driver CLASS 1 4 wheel service, dump, and batch trucks, Oil Distributor - Asphalt Distributor-Tandems	\$29.24		\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.44	\$60.06
<b>Apprentice</b>	<b>Percent</b>											
First 6 months	80.00	\$23.39	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.59	\$51.29
7-12 months	85.00	\$24.85	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.05	\$53.48
13-18 months	90.00	\$26.32	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.52	\$55.67
19-24 months	95.00	\$27.78	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.98	\$57.87
25-30 months	100.00	\$29.24	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.44	\$60.06

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :**

3 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY,

HIGHLAND, HOCKING, HOLMES, HURON,  
JACKSON, JEFFERSON, KNOX, LAWRENCE,  
LICKING, LOGAN, LORAIN, LUCAS, MADISON,  
MAHONING, MARION, MEDINA, MEIGS, MERCER,  
MIAMI, MONROE, MONTGOMERY, MORGAN,  
MORROW, MUSKINGUM, NOBLE, OTTAWA,  
PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE,  
PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY,  
SCIOTO, SENECA, SHELBY, STARK, SUMMIT,  
TRUMBULL, TUSCARAWAS, UNION, VAN WERT,  
VINTON, WARREN, WASHINGTON, WAYNE,  
WILLIAMS, WOOD, WYANDOT

**Special Jurisdictional Note :**

**Details :**

\*\* Asphalt - Oil spray bar man when operating from cab shall receive \$0.20 cents per hour above their Basic Hourly Rate.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Truck Driver Bldg & HevHwy Class 2**  
**Locals 20,40,92,92b,100,175,284,438,377,637,908,957**

**Change # : LCRO1-2021fbBldgHewHwy**

**Craft : Truck Driver Effective Date : 05/21/2021 Last Posted : 05/21/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Truck Driver CLASS 2 Tractor Trailer-Semi Tractor Trucks-Pole Trailers-Ready Mix Trucks-Fuel Trucks- Asphalt-Oil Spray bar men- 5 Axle & Over - Belly Dumps-End Dumps-Articulated Dump Trucks- Low boys-Heavy duty Equipment(irrespective of load carried) when used exclusively for transportation-Truck Mechanics (when needed)	\$29.66		\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.86	\$60.69
<b>Apprentice</b>	<b>Percent</b>											
First 6 months	80.00	\$23.73	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.93	\$51.79
7-12 months	85.00	\$25.21	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.41	\$54.02
13-18 months	90.00	\$26.69	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.89	\$56.24
19-24 months	95.00	\$28.18	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$44.38	\$58.47
25-30 months	100.00	\$29.66	\$7.50	\$8.50	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.86	\$60.69

**Special Calculation Note :** No special calculations for this skilled craft wage rate are required at this time.

**Ratio :**

3 Journeymen to 1 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, ALLEN, ASHLAND, ASHTABULA, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COLUMBIANA, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, ERIE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY,



HIGHLAND, HOCKING, HOLMES, HURON,  
JACKSON, JEFFERSON, KNOX, LAWRENCE,  
LICKING, LOGAN, LORAIN, LUCAS, MADISON,  
MAHONING, MARION, MEDINA, MEIGS, MERCER,  
MIAMI, MONROE, MONTGOMERY, MORGAN,  
MORROW, MUSKINGUM, NOBLE, OTTAWA,  
PAULDING, PERRY, PICKAWAY, PIKE, PORTAGE,  
PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY,  
SCIOTO, SENECA, SHELBY, STARK, SUMMIT,  
TRUMBULL, TUSCARAWAS, UNION, VAN WERT,  
VINTON, WARREN, WASHINGTON, WAYNE,  
WILLIAMS, WOOD, WYANDOT

**Special Jurisdictional Note :**

**Details :**

\*\* Asphalt - Oil spray bar man when operating from cab shall receive \$0.20 cents per hour above their Basic Hourly Rate.

# Prevailing Wage Rate Skilled Crafts

Name of Union: Bricklayer Local 18

**Change # : LCN01-2021fbLoc18**

**Craft : Bricklayer Effective Date : 06/01/2021 Last Posted : 05/26/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Bricklayer	\$30.87		\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.74	\$62.17
Stone Mason	\$30.87		\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.74	\$62.17
Pointer Caulker Cleaner	\$30.87		\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.74	\$62.17
Refractory Workers	\$31.87		\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$47.74	\$63.67
Refractory Worker Hot Pay	\$33.87		\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$49.74	\$66.67
Sawman	\$31.12		\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.99	\$62.55
Layout Man	\$31.12		\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.99	\$62.55
Free Standing Chimney	\$31.37		\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$47.24	\$62.92
<b>Apprentice</b>	<b>Percent</b>											
1st 6 months	60.00	\$18.52	\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.39	\$43.65
2nd 6 months	65.00	\$20.07	\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$35.94	\$45.97
3rd 6 months	70.00	\$21.61	\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.48	\$48.28
4th 6 months	75.00	\$23.15	\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.02	\$50.60
5th 6 months	80.00	\$24.70	\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$40.57	\$52.91
6th 6 months	85.00	\$26.24	\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.11	\$55.23
7th 6 months	90.00	\$27.78	\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.65	\$57.54
8th 6 months	95.00	\$29.33	\$9.45	\$5.79	\$0.63	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.20	\$59.86

MASON FINISHER 1st 180 Days	45.00	\$13.89	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$13.89	\$20.84
1st Year H&W after 6 months	45.00	\$13.89	\$9.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$23.34	\$30.29
2nd Year	50.00	\$15.44	\$9.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$24.88	\$32.60

**Special Calculation Note :** \*\*In order to utilize a Pre-Apprentice, you must have 1 Registered Apprentice in your employ.

**Ratio :**

- 1-2 Journeyman to 1 Apprentice
- 3-4 Journeyman to 2 Apprentice
- 5-6 Journeyman to 2 Apprentice
- 7-10 Journeyman to 3 Apprentice

- 1 Apprentice permits 1 Mason Trainee
- 2 Apprentice permits 1 Mason Trainee
- 3 Apprentice permits 2 Mason Trainees
- 4 Apprentice permits 2 Mason Trainees

For each additional 5 Journeyman to 1 Apprentice, for every 3 additional Apprentices, 1 Mason Finisher may be added

**Jurisdiction ( \* denotes special jurisdictional note ) :**

BROWN, BUTLER, CLERMONT, HAMILTON, PREBLE\*, WARREN

**Special Jurisdictional Note :** In Preble County the following townships are included: (Dixon, Gasper, Graits, Israel, Lanier and Somers)

**Details :**

MASON FINISHER:duties shall be to work in all aspects of Masonry construction taking direction from the employer and the Journeyman Bricklayer & Stone Mason's working on the job. Mason Finisher's may work on job site only when a registered apprentice is on job and the ratios in table above will strictly be enforced.

Refractory work is classified as working with any of the following materials: Acid brick, carbon black brick or carbon black block, firebrick grinding, plastics (with a gun) and any resinous cement.

Fifty cents (\$0.50) per hour above scale shall be paid to employees working on free standing industrial or institutional chimneys which are completely detached from any building structure.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Bricklayer Local 18 Tile Finisher**

**Change # : LCN01-2020fbLoc18**

**Craft : Bricklayer Effective Date : 09/01/2020 Last Posted : 08/20/2020**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Bricklayer Tile Marble Terrazzo Finisher	\$25.74		\$9.47	\$5.29	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.01	\$53.88
Terrazzo Base Grinder	\$26.24		\$9.47	\$5.29	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.51	\$54.63
Marble Sander Polisher	\$25.84		\$9.47	\$5.29	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$41.11	\$54.03
<b>Apprentices</b>	<b>Percent</b>											
1st 6 months 0-600 hrs	60.00	\$15.44	\$9.47	\$5.29	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$30.71	\$38.44
2nd 6 months 601-1200 hrs	65.00	\$16.73	\$9.47	\$5.29	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$32.00	\$40.37
3rd 6 months 1201-1800 hrs	70.00	\$18.02	\$9.47	\$5.29	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$33.29	\$42.30
4th 6 months 1801-2400 hrs	75.00	\$19.30	\$9.47	\$5.29	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.57	\$44.23
5th 6 months 2401-3000 hrs	80.00	\$20.59	\$9.47	\$5.29	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$35.86	\$46.16
6th 6 months 3001-3600	90.00	\$23.17	\$9.47	\$5.29	\$0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$38.44	\$50.02
1-30 Days Prior to Entering Apprenticeship	50.00	\$12.87	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$12.87	\$19.30

**Special Calculation Note :** Classification title contains "Bricklayer" because contract originates within the Bricklayer Local.

Note that the classification description is clarified after the local union number at the top of the page. \*\*In order to utilize a Pre-Apprentice, you must have 1 Registered Apprentice in your employ.\*\*

**Ratio :**

- 1 Journeyman to 1 Apprentice
- 5 Journeymen to 1 Apprentice
- 10 Journeymen to 2 Apprentices

**Jurisdiction ( \* denotes special jurisdictional note ) :**

- ADAMS, BROWN, BUTLER, CLERMONT, GALLIA, HAMILTON, LAWRENCE, PREBLE\*, SCIOTO, WARREN, WARREN\*

15 Journeymen to 3 Apprentices  
20 Journeymen to 4 Apprentices  
25 Journeymen to 5 Apprentices

**Special Jurisdictional Note :** Warren in the townships of Dixon, Gasper, Isrsel, Somers & Gratis in Prebble County

**Details :**

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Bricklayer Local 18 Tile Mechanic**

**Change # : LCN01-2020fbLoc18**

**Craft : Bricklayer Effective Date : 09/01/2020 Last Posted : 08/20/2020**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Bricklayer Tile Terrazzo Marble Mason Mechanic	\$30.28		\$9.47	\$5.29	\$0.56	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.60	\$60.74
Marble Layout Work	\$30.78		\$9.47	\$5.29	\$0.56	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$46.10	\$61.49
Swing Scaffold Worker	\$31.78		\$9.47	\$5.29	\$0.56	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$47.10	\$62.99
Apprentice after 2 years (2400 hrs) as Apprentice Finisher												
5th/6 Months 0- 600 hrs.	70.00	\$21.20	\$9.47	\$5.29	\$0.56	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$36.52	\$47.11
6th/6 months 601-1200 hrs.	75.00	\$22.71	\$9.47	\$5.29	\$0.56	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$38.03	\$49.39
7th/6 months 1201-1800 hrs.	80.00	\$24.22	\$9.47	\$5.29	\$0.56	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.54	\$51.66
8th/6 months 1801-2400 hrs.	90.00	\$27.25	\$9.47	\$5.29	\$0.56	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.57	\$56.20

**Special Calculation Note :** Classification title contains "Bricklayer" because contract originates within the Bricklayer Local.

Note that the classification description is clarified after the local union number at the top of the page.

**Ratio :**

- 1 Journeyman to 1 Apprentice
- 5 Journeymen to 1 Apprentice
- 10 Journeymen to 2 Apprentices
- 15 Journeymen to 3 Apprentices
- 20 Journeymen to 4 Apprentices
- 25 Journeymen to 5 Apprentices

**Jurisdiction ( \* denotes special jurisdictional note ) :**

ADAMS, BROWN, BUTLER, CLERMONT, GALLIA, HAMILTON, LAWRENCE, PREBLE\*, SCIOTO, WARREN

**Special Jurisdictional Note :** In Preble County the Townships of Dixon, Israel, Gasper, Lanier, Somers and Gratis.

**Details :**

\*\*In order to utilize a Pre-Apprentice, you must have 1 Registered Apprentice in your employ.\*\*

# Prevailing Wage Rate Skilled Crafts

Name of Union: Bricklayer Local 22

**Change # : LCN01-2021fbLoc22**

**Craft : Bricklayer Effective Date : 06/01/2021 Last Posted : 05/26/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Bricklayer Stone Mason Refractory	\$28.74		\$8.85	\$6.89	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.03	\$59.40
Pointer/Caulker/Cleaner	\$28.74		\$8.85	\$6.89	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$45.03	\$59.40
Improver Apprentices 25 day probationary period then												
1st 6 months	\$18.68		\$8.85	\$0.00	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$28.08	\$37.42
2nd 6 months	\$21.56		\$8.85	\$0.00	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$30.96	\$41.74
3rd 6 months	\$24.43		\$8.85	\$5.59	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.42	\$51.63
4th 6 months	\$27.30		\$8.85	\$5.59	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.29	\$55.94
<b>Bricklayer Stone Mason Refractory and PCC Apprentice</b>	<b>Percent</b>											
1st 6 months	60.00	\$17.24	\$8.85	\$0.00	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$26.64	\$35.27
2nd 6 months	65.00	\$18.68	\$8.85	\$0.00	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$28.08	\$37.42
3rd 6 months	70.00	\$20.12	\$8.85	\$5.59	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$35.11	\$45.17
4th 6 months	75.00	\$21.55	\$8.85	\$5.59	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$36.55	\$47.32
5th 6 months	80.00	\$22.99	\$8.85	\$5.59	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$37.98	\$49.48
6th 6 months	85.00	\$24.43	\$8.85	\$5.59	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$39.42	\$51.63
7th 6 months	90.00	\$25.87	\$8.85	\$5.59	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$40.86	\$53.79
8th 6 months	95.00	\$27.30	\$8.85	\$5.59	\$0.55	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.29	\$55.94
Mason Trainee-1-90 Days	45.00	\$12.93	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$12.93	\$19.40
91-365 Days	45.00	\$12.93	\$8.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$21.78	\$28.25
2nd Year	50.00	\$14.37	\$8.85	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$23.22	\$30.41

**Special Calculation Note :** Classification title contains "Bricklayer" because contract originates within the Bricklayer Local.

Note that the classification description is clarified after the local union number at the top of the page. Apprentice and Apprentice Improver, Health and Welfare after 60 days. Mason Trainees Health and Welfare



after 90 days.

**Ratio :**

Bricklayer Stone Mason Refractory Worker:

1-2 Journeymen to 1 Apprentice

3-4 Journeymen to 2 Apprentice

5-6 Journeymen to 2 Apprentice

7-10 Journeymen to 3 Apprentice

Mason Trainee Ratio:

1 Apprentice permits 1 Mason Trainee

2 Apprentice permits 1 Mason Trainee

3 Apprentice permits 2 Mason Trainee

4 Apprentice permits 2 Mason Trainee

\*\*\*In order to utilize a Pre-Apprentice, you must have 1 registered apprentice in your employ\*\*\*.

Ratio of Improver Apprentices to Journeymen in no case shall their be no more than 1 Improver Apprentice to 6 Journeymen

**Special Jurisdictional Note :** In Preble County the following townships are included: Jackson, Monroe, Harrison, Twin, Jefferson and Washington

**Details :**

Apprentice Ratio's covers: Bricklayer, Stone Mason, Refractory worker and Pointer, Cleaner, Caulker.

**Jurisdiction ( \* denotes special jurisdictional note ) :**

CHAMPAIGN, CLARK, CLINTON, DARKE, GREENE, HIGHLAND, LOGAN, MIAMI, MONTGOMERY, PREBLE\*, SHELBY

# Prevailing Wage Rate Skilled Crafts

Name of Union: **Bricklayer Local 22 Tile Finisher**

**Change # : LCN01-2021sksLoc22**

**Craft : Bricklayer Effective Date : 08/13/2021 Last Posted : 08/13/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
<b>Classification</b>												
Bricklayer Tile Marble Terrazzo Finisher	\$24.48		\$3.25	\$6.16	\$0.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.33	\$46.57
Base Machine	\$24.98		\$3.25	\$6.16	\$0.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.83	\$47.32
<b>Apprentice</b>	<b>Percent</b>											
1st 6 months 0-600 hrs	60.00	\$14.69	\$3.25	\$0.00	\$0.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$18.38	\$25.72
2nd 6 months 601-1200 hrs	65.00	\$15.91	\$3.25	\$0.00	\$0.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$19.60	\$27.56
3rd 6 months 1201-1800 hrs	70.00	\$17.14	\$3.25	\$6.16	\$0.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$26.99	\$35.55
4th 6 months 1801-2400	75.00	\$18.36	\$3.25	\$6.16	\$0.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$28.21	\$37.39
5th 6 months 2401-3000 hrs	80.00	\$19.58	\$3.25	\$6.16	\$0.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$29.43	\$39.23
6th 6 months 3001-3600 hrs	90.00	\$22.03	\$3.25	\$6.16	\$0.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$31.88	\$42.90
TMT Helper- May enter Apprentice Program after 90 day completionr			\$3.25	\$6.16	\$0.44							
First 90	45.00	\$11.02	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$11.02	\$16.52

Days										
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**Special Calculation Note :** Classification title contains "Bricklayer" because contract originates within the Bricklayer Local.

Note that the classification description is clarified after the local union number at the top of the page.

**\*\*\*Medical Savings Account\*\*\*:** The Medical Savings Account can only be deducted providing employee shows proof voluntary enrollment in the program. Minimum contribution of \$1.00 per hourworked with no maximum.

**Ratio :** **Jurisdiction ( \* denotes special jurisdictional note ) :**

- 1 Journeyman 1 Apprentice
- 5 Journeyman 1 Apprentice
- 10 Journeyman 2 Apprentice
- 15 Journeyman 3 Apprentice
- 20 Journeyman 4 Apprentice
- 25 Journeyman 5 Apprentice
- 8 Employees 1 Helper

AUGLAIZE, CHAMPAIGN, CLARK, CLINTON, DARKE, GREENE, HARDIN, HIGHLAND, LOGAN, MERCER, MIAMI, MONTGOMERY, PREBLE\*, SHELBY

**Special Jurisdictional Note :** In Preble County the following townships are included: (Jackson, Monroe, Harrison, Twin and Washington)

**Details :**

Tile Layer Finishers shall do mixing of mortars & adhesives, cleaning & grouting of tile, unloading of all trucks, unpacking & handling of all tile & materials such as sand, lime, cement, tile, & all types of tile panels, prefabricated on job site. Marble Setter Finishers shall do all cleaning, waxing & polishing, grouting and pointing.

# Prevailing Wage Rate Skilled Crafts

**Name of Union: Bricklayer Local 22 Tile Mechanics**

**Change # : LCN01-2021sksLoc22**

**Craft : Bricklayer Effective Date : 08/13/2021 Last Posted : 08/13/2021**

	BHR		Fringe Benefit Payments					Irrevocable Fund		Total PWR	Overtime Rate	
			H&W	Pension	App Tr.	Vac.	Annuity	Other	LECET (*)			MISC (*)
Classification												
Bricklayer Tile Marble Terrazzo Mechanics	\$27.70		\$8.12	\$5.96	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.30	\$56.15
Terrazzo Worker	\$27.70		\$8.12	\$5.96	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$42.30	\$56.15
Apprentice	Percent											
1st 6 Months	50.00	\$13.85	\$8.12	\$0.00	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$22.49	\$29.41
2nd 6 Months	55.00	\$15.24	\$8.12	\$0.00	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$23.87	\$31.49
3rd 6 Months	60.00	\$16.62	\$8.12	\$5.96	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$31.22	\$39.53
4th 6 Months	65.00	\$18.00	\$8.12	\$5.96	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$32.61	\$41.61
5th 6 months	70.00	\$19.39	\$8.12	\$5.96	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$33.99	\$43.68
6th 6 months	75.00	\$20.77	\$8.12	\$5.96	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$35.38	\$45.76
7th 6 months	85.00	\$23.54	\$8.12	\$5.96	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$38.15	\$49.92
8th 6 months	95.00	\$26.31	\$8.12	\$5.96	\$0.52	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$40.92	\$54.07

**Special Calculation Note :** Classification title contains "Bricklayer" because contract originates within the Bricklayer Local.

Note that the classification description is clarified after the local union number at the top of the page.

**Ratio :**

- 5 Journeymen to 1 Apprentice
- 10 Journeymen to 2 Apprentice
- 15 Journeymen to 3 Apprentice
- 20 Journeymen to 4 Apprentice
- 25 Journeymen to 5 Apprentice

**Jurisdiction ( \* denotes special jurisdictional note ) :**

CHAMPAIGN, CLARK, CLINTON, DARKE, GREENE, HIGHLAND, LOGAN, MIAMI, MONTGOMERY, PREBLE\*, SHELBY

**Special Jurisdictional Note :** In Preble County the following townships are included: (Jackson, Jefferson, Monroe, Harrison, Twin and Washington)

**Details :**

\*\* (Tile layers work) the laying, cutting or setting of all tile where used for floors, walls, ceilings, walks, promenade roofs, stair treads, stair risers, facings, hearths, fireplaces & decorative inserts together with any marble plinths, thresholds or window stools used in connection with any tile work. the building, shaping forming construction or repairing of all fireplace work, whether in connection with a mantel hearth facing or not, & the setting & preparing of all material such as cement, plaster, mortar, brickwork, iron work or other materials necessary for the proper, safe construction & completion of such work: except that a mantel made exclusively of brick, marble or stone shall be conceded to be bricklayers, marble setters or stonemasons' work respectively.

\*\* Marble, mosaic, venetian enamel & terrazzo. Cutting and assembling of mosaics. all rolling of terrazzo work.

\*\* Caulking of all expansion, perimeter & angle joints shall be the exclusive work of the tile mechanic.

\*\* Marble masons shall consist of carving, cutting & setting of all marble, slate (including blackboards) stone, alberene, carrara, sanionyx, vitrolite & similar opaque glass, scagliola, what ever thickness or dimension.

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

1.2 SUMMARY

- A. Section Includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Work by Owner.
  - 4. Work under separate contracts.
  - 5. Future work.
  - 6. Access to site.
  - 7. Coordination with occupants.
  - 8. Work restrictions.
  - 9. Specification and Drawing conventions.
  - 10. Miscellaneous provisions.
- B. Related Requirements:
  - 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: DOT-200023 ODOT – Eaton Outpost
  - 1. Project Location: 5656 US-127, Eaton, Ohio 45320
- B. Contracting Authority: Ohio Facilities Construction Commission
  - 1. Contracting Authority's Representative: Wade Simpson, 30 W. Spring St., Fourth Floor, Columbus, Ohio 43215, 614.387.1270.
- C. Owner: Ohio Department of Transportation
  - 1. Owner's Representative: Todd Efke, 1980 W. Broad St., Columbus, Ohio 43223, 614.466.3381.

- D. Architect: Jerome M. Scott Architects, Inc.
  - 1. Architect's Representative: Dano Boyne, 1020 Goodale Blvd., Columbus, Ohio 43212, 614.225.9535.
  
- E. Web-Based Project Software: Project software administered by Owner will be used for purposes of managing communication and documents during the construction stage.
  - 1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

#### 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
  - 1. Construction of a new wood-framed truck storage building with office and wash bay and associated site and utility modifications and other Work indicated in the Contract Documents.
  
- B. Type of Contract:
  - 1. Project will be constructed under a single prime contract.

#### 1.5 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

#### 1.6 ACCESS TO SITE

- A. **Access: The site will remain fully operational under complete control of the Owner until April 01, 2022 regardless of the date of issuance of the Notice to Proceed. On this date, the site will be turned over to the contractor for commencement of on-site construction activity. An area on site may be designated for material laydown and construction trailer mobilization prior to April 01, 2022 subject to Owner approval.**
  
- B. Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Limits: Confine construction operations to areas where work is to be performed.
    - a. A portion of the site may be designated for material laydown and shall be coordinated with the Owner prior to construction activities. If laydown space is designated outside of the area of new work, it shall be returned to its original condition at the completion of construction.

2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
  3. Maintain clear vehicular access to remaining buildings on site to be accessed by Owner during construction.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

#### 1.7 COORDINATION WITH OCCUPANTS

- A. Full Owner Access: Owner will access site and existing adjacent building(s) intermittently throughout the entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
1. Maintain access to all adjacent occupied or used buildings/facilities on site. Do not close or obstruct walkways or other occupied or used buildings/facilities without written permission from Owner and approval of authorities having jurisdiction.
  2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

#### 1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Architect and Owner not less than three in advance of proposed utility interruptions.
  2. Obtain Architect's and Owner's written permission before proceeding with utility interruptions.
- C. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.



## 1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

## 1.10 MISCELLANEOUS PROVISIONS

- A. The Owner has submitted and paid for the Plan Approvals from the Ohio Department of Commerce, Division of Industrial Compliance, Bureau of Construction Compliance. The respective Contractors shall provide approvable documents for the shop fabricated trusses to the Architect/Engineer for submission to the Bureau of Construction Compliance for the remaining Permits. The Contractor shall obtain all regulatory approvals and pay all fees as necessary to obtain Fire Marshal, OSHA and OEPA approvals for the work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

## SECTION 012100 - ALLOWANCES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.

#### 1.3 DEFINITIONS

- A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

#### 1.4 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

#### 1.5 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

#### 1.7 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

#### 1.8 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
  - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
  - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
  - 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
  - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
  - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
  - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance A-1: Lump-Sum Allowance: Include a lump sum price of \$19,500.00 in the base bid for subcontracting of NWOSS (Northwestern Ohio Security Systems) to cover the portion of security scope as defined in the attached proposal. Any and all related work included in the construction documents that is not included in the scope of work assigned to NWOSS in the attached proposal shall be provided by the Contractor and included in the base bid.
- B. Allowance A-2: Lump-Sum Allowance: Include a lump sum price of \$60,000.00 in the base bid to cover Electric Company charges for their portion of providing electrical service to the site as described in the Plans and Specifications.

END OF SECTION 012100



**DATE ISSUED**  
December 1, 2021

**VALID UNTIL**  
December 31, 2021

# Access Control and Camera Modification at 40' Pitch OP

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QUOTE: 10837-1-0

**PREPARED FOR:**

ODOT District 8  
5656 US 127 North  
Eaton, OH 45320

Andrew Stefanik  
Statewide Security Coordinator  
P: (614)-275-1388  
E: Andrew.Stefanik@Dot.Ohio.Gov

**PREPARED BY:**

John Kostelac  
Sales Manager  
P: 419-227-1655  
E: kostelacjohn@nwoss.com  
W: nwoss.com

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## PROJECT OVERVIEW

### PROJECT INVESTMENT

**\$19,389.65**

The above price includes equipment, materials, and labor as described within this proposal. Shipping and freight charges may not be included unless specified.

## YOUR DEDICATED PROJECT TEAM

### YOUR NWOSS SALES REP

John Kostelac  
419-227-1655  
[kostelacjohn@nwoss.com](mailto:kostelacjohn@nwoss.com)

### YOUR NWOSS ENGINEER

Brad Purtee  
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## PROJECT DESCRIPTION

### SUMMARY OF PROJECT EXCLUSIONS & ASSUMPTIONS

	INCLUDE	EXCLUDE	PARTIAL		INCLUDE	EXCLUDE	PARTIAL
120 VAC Power	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Network Cabling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Bonding	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Network Hardware	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Conduit	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	On-Site Support	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Construction Equipment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Patch & Touch-Up Paint	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Coring	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Permits	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Demo Existing Cabling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Prevailing Wage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Demo Existing Conduit	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Programming	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Demo Existing Equipment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Remote Support	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Door/Frame Preparation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Stub-Ups & Back-Boxes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Fire Stopping	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Submittals	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Installation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	System Drawings	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lift Rental	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	System Training	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Locking Hardware	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Other (see below)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### SCOPE OF WORK

#### ODOT District 8 - 40' Pitch Outpost

NWOSS's proposal includes adding access control to 1 door, reinstalling 1 existing gate, reinstalling 2 existing doors of access, and reinstalling 3 existing cameras at the **D08 40' Pitch** facility.

All equipment within this quote is dependent upon the manufacturer's availability for delivery. Once this quote is purchased, NWOSS will inform the customer of any extended wait times for any equipment, NWOSS can offer the customer substitutes if available.

#### Project Details:

- There are **4** points of access control, 3 doors and 1 gate.
- **All Locks will be electric strike, Locks provided AND installed by others.**
- There are door contacts on all door except gates, door frames prepped by others.
- 120VAC power for all systems by others as needed.
- All Conduit and pull strings provided by others.
- All Panels (Security and Access) installed, and programmed by NWOSS.
- All devices for the access control system (except electrified door locks and existing devices) is provided by NWOSS.
- All mounting of devices for the access control system (except electrified door locks) is provided by NWOSS
- All Wire and labor to pull wire for the access control system is provided by NWOSS.



**Devices to be reused:**

- 2 door readers
- 2 REX motions
- 2 gate readers
- 2 gate back boxes
- 1 access control panel
- 3 outdoor cameras

**Warranty is one year parts and labor**

Please initial below to confirm the Scope of Work:

Initials: \_\_\_\_\_

## RESPONSIBILITY OF NWOSS

- Provide CAD drawings showing device locations. As-Builts will be done at the end of the project.
- Provide all the equipment listed above.
- Pull all wire and mount all field devices.
- Install all ODOT supplied existing equipment that has been listed.
- Terminate all Head end Equipment.
- Program and test all systems.
- Train the customer.
- All Labor is based off of Prevailing Wage rates.

## REQUIREMENTS OF CUSTOMER

- Provide access to the facility during regular business hours.
- Provide **End to End conduit** WITH pull string as required to necessary device locations.
- Remove all existing security equipment and turn over to NWOSS for re-installation.
- Provide door contact and strike prepped with boxes above and to the side of the door frames with strikes installed.
- Provide and install all electric locks.
- Provide network switches in Data Closet and Cold Storage with PoE capability to power the cameras.
- Provide a server/storage device for loading the Milestone Recording Server software.
- Provide authorized personnel for training.

## PROJECT FINANCIAL SUMMARY

<b>State Term Contract 7635</b>	<b>\$19,389.65</b>
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### EQUIPMENT

QTY	MANUFACTURER	PART #	DESCRIPTION	UNIT PRICE	EXT.PRICE
1	Lenel-S2	S2-ACM	Lenels2 Access Control Application Blade Access C	\$687.23	\$687.23
1	Hid Global	5395CG100	ThinLine li Wiegand Classic Gray Cable Rohs Pro	\$177.19	\$177.19
1	Bosch Security	DS160	Pir Request To Exit Sensor With Sounder Gray	\$60.38	\$60.38
1	Bosch Security	TP160	Trim Plate For Ds150Ds160	\$1.73	\$1.73
3	Bosch Security	ISN-CSD80-W-E	1 Stubby Recessed Contact White	\$2.38	\$7.14
2	Windy City Wire	4351	22/6 Stpl Oas 1000	\$218.66	\$437.32
2	Windy City Wire	4380	22/4 Stpl 1000	\$133.88	\$267.76
2	Windy City Wire	4360	22/2 Stpl 1000	\$86.28	\$172.56
2	Windy City Wire	2360	18/2 Stpl 1000	\$147.26	\$294.52
1	Windy City Wire	714410VNQ	18/6 St Oas Db 1000	\$664.91	\$664.91
1	Windy City Wire	727110VNQ	18/2 Db 1000	\$272.21	\$272.21
2	Windy City Wire	5566030	Cat 6 Pl 1000 Yellow	\$357.00	\$714.00
8	Adi	IC1078F6YL	Icc Modular Connector Category 6 Yellow	\$4.00	\$32.00
1	Adi	IC107BP241	Icc 24 Port Black Patch Panel	\$14.82	\$14.82
4	Adi	IC107SB1WH	Icc Single Port Surface Mount Box	\$4.00	\$16.00
4	Adi	ICPCSK03YL	Icc Cat 6 3' Patch Cord	\$3.42	\$13.68
4	Adi	ICPCSK05YL	Icc Cat 6 5' Patch Cord	\$3.79	\$15.16
4	Adi	ICPCSK01YL	Icc Cat 6 1' Patch Cord	\$2.16	\$8.64

### LABOR

QTY	DESCRIPTION	UNIT PRICE	EXT.PRICE
104	PW Labor Rate - MMA7635	\$149.35	\$15,532.40

**Total Purchase Price** **\$19,389.65**

*Taxes are not included.*

## PAYMENT TERMS

## PROJECT AGREEMENT

This agreement is made and entered into effective as of the date the agreement is signed below by and between ODOT District 8 ("Customer") and Northwestern Ohio Security Systems, Inc. ("NWOSS"). NWOSS agrees to provide the equipment, software, and/or services identified in the Project Description of this proposal. The quotation is based upon acceptance of NWOSS insurance certification as "adequate for coverage" to meet purchasing and contract requirements. Certificate is available upon request.

There is a 25% cancellation fee and all equipment must be returned per NWOSS standard RMA procedures. The customer is responsible for all collection costs such as associated interest and attorney's fees.

## PROJECT ACCEPTANCE

I have read the project outlined in this proposal, the payment terms, and the project agreement. I fully understand and agree to abide by the terms set forth herein. I hereby certify that I am authorized by my company to sign this agreement. NWOSS is hereby authorized to perform the work as specified herein.

### ACCEPTED BY: ODOT District 8

**SIGNATURE:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**NAME, PRINTED:** \_\_\_\_\_

**TITLE:** \_\_\_\_\_

**PO NUMBER:** \_\_\_\_\_

## SECTION 012300 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

#### 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

#### 1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
- C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate 1: Wash Bay Overhead Door

1. Install high speed rolling door (Specification 08 36 14 - Alternate) at wash bay in lieu of wash bay overhead sectional door (Specification 08 36 14).
  - a. Base Bid: Install overhead sectional door at wash bay in accordance with Specification 08 36 14.
  - b. Alternate: Install high speed rolling door at wash bay in accordance with Specification 0836 14 - Alternate.

B. *Alternate 2 (Deduct): Asphalt Shingle Roof*

1. *Install asphalt shingle roof (Specification 07 31 13) in lieu of standing-seam metal roof (Specification 07 41 13).*
  - a. *Base Bid: Install standing-seam metal roof (07 41 13) as defined in the drawings and specifications.*
  - b. *Alternate: Delete standing seam metal roof. Install asphalt shingle roof in accordance with specification 07 31 13. Metal fascia/soffit panels, gutters, and downspouts to remain as specified in section 07 41 13.*

C. *Alternate 3 (Deduct): Truck Storage Interior Wall/Ceiling Finish*

1. *Install glass-mat gypsum board with epoxy paint finish on Truck Storage (Room 103) walls and ceiling in lieu of metal liner panels.*
  - a. *Base Bid: Install metal liner panels (07 42 13.2) on Truck Storage walls and ceiling as defined in the drawings and specifications.*
  - b. *Alternate: Delete metal liner panels from interior walls and ceiling of Truck Storage. Replace with 1/2" glass-mat interior gypsum board (09 29 00, 2.3-D). Prime and finish paint with high build gloss epoxy (09 96 00, 2.6-A).*

END OF SECTION 012300

## SECTION 012500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for products selected under an allowance.
  - 2. Section 012300 "Alternates" for products selected under an alternate.
  - 3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.3 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.

#### 1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit a completed Product Approval Request Form (016000.1) and associated documentation for 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. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.

- b. Coordination of 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.
  - c. Detailed comparison of significant qualities of proposed substitutions 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 as well as 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 substitutions 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.
2. 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.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

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

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 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. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
- c. Substitution request is fully documented and properly submitted.
- d. Requested substitution will not adversely affect Contractor's construction schedule.
- e. Requested substitution has received necessary approvals of authorities having jurisdiction.
- f. Requested substitution is compatible with other portions of the Work.
- g. Requested substitution has been coordinated with other portions of the Work.
- h. Requested substitution provides specified warranty.
- i. 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 no less than 10 days prior to bid opening in accordance with 002113 "Instructions to Bidders". Requests received after that time shall not be considered.

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. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
- e. Substitution request is fully documented and properly submitted.
- f. Requested substitution will not adversely affect Contractor's construction schedule.
- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified warranty.
- k. 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 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 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. RFIs.
  - 4. Digital project management procedures.
  - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
  - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

#### 1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.4 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, telephone number, and email address 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 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.

#### 1.5 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. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with 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 with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

- C. 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.

- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities 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.

## 1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated 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 to describe relationship of various systems and components.
    - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    - f. Indicate required installation sequences.
    - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative 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 plenums to accommodate layout of light fixtures and other components 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 (32 mm) 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. Review: Architect will review coordination drawings to confirm that in general 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 suitable modifications and resubmit.
  9. 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 Submittal Format: Submit or post coordination drawing files using PDF format.
  2. 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.
- 1.7 REQUEST FOR INFORMATION (RFI)
- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  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: Owner's software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow three days for Architect's response for each RFI.
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 by Architect 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 the General Conditions.

- a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in accordance with the General Conditions within 7 days of receipt of the RFI response.
- E. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

## 1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model and/or CAD drawings will be provided by Architect for Contractor's use if requested.
  1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
  2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
  3. Contractor shall execute Architect's Electronic File Release Agreement prior to release of digital data files.
    - a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall be bound to the conditions of the Electronic File Release Agreement executed by the Contractor.
- B. Web-Based Project Software: Use Owner's web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.
  1. Web-based Project software site includes, at a minimum, the following features:
    - a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    - c. Document workflow planning, allowing customization of workflow between project entities.
    - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    - e. Processing and tracking of payment applications.
    - f. Processing and tracking of contract modifications.
    - g. Creating and distributing meeting minutes.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare 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.

3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

## 1.9 PROJECT MEETINGS

- A. Preconstruction Conference: Architect will 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. Attendees: Authorized representatives of Owner, 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.
2. Agenda: Discuss items of significance that could affect progress, including the following:

- a. Responsibilities and personnel assignments.
- b. Tentative construction schedule.
- c. Phasing.
- d. Critical work sequencing and long lead items.
- e. Designation of key personnel and their duties.
- f. Lines of communications.
- g. Use of web-based Project software.
- h. Procedures for processing field decisions and Change Orders.
- i. Procedures for RFIs.
- j. Procedures for testing and inspecting.
- k. Procedures for processing Applications for Payment.
- l. Distribution of the Contract Documents.
- m. Submittal procedures.
- n. Preparation of Record Documents.
- o. Use of the premises.
- p. Work restrictions.
- q. Working hours.
- r. Owner's occupancy requirements.
- s. Responsibility for temporary facilities and controls.
- 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.

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

- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for 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 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. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written instructions.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. 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.
- C. Progress Meetings: Architect will conduct progress meetings at weekly intervals.
1. Attendees: In addition to representatives of Owner 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.
  2. 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) Status of submittals.
    - 4) Deliveries.
    - 5) Off-site fabrication.
    - 6) Access.
    - 7) Site use.
    - 8) Temporary facilities and controls.
    - 9) Progress cleaning.
    - 10) Quality and work standards.
    - 11) Status of correction of deficient items.
    - 12) Field observations.
    - 13) Status of RFIs.
    - 14) Status of Proposal Requests.
    - 15) Pending changes.
    - 16) Status of Change Orders.
    - 17) Pending claims and disputes.
    - 18) Documentation of information for payment requests.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100



## SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. This Section includes Preliminary Construction Schedule, Baseline Schedule, Monthly Progress Schedules, and Recovery Schedules.
  - 1. For clarity, this Section uses the term Schedule Manager for activities performed by the Contractor (General Contracting).
  - 2. In its Base Bid, the Contractor shall include providing scheduling services to meet these requirements.
- B. Accepted Schedules will be used to plan organize, and execute the work, to measure the progress of the work, to coordinate and complete remaining work, to aid in evaluating time extensions, and to provide the basis for all progress payments.
- C. Failure to maintain Schedules in a contract compliant status may result in the Contracting Authority withholding payment until the schedule is accepted in accordance with Section 9.8 of the General Conditions.
- D. Related Sections:
  - 1. 01 10 00 – Summary of Work
  - 2. 01 73 00 – Execution
  - 3. 01 77 00 –Closeout Procedures

#### 1.02 DEFINITIONS

- A. Construction Type 1 - Earth Moving: Construction activities include but not limited to excavation, grading, trenching, backfilling, landscaping.
- B. Construction Type 2 - Structures and Surfacing: Construction activities include but not limited to civil structures, engineered structures, architectural assemblies, pavements.

#### 1.03 SUBMITTALS

- A. 90-Day Preliminary Schedule with Narrative Report: Defines the Contractor's planned operations for the first 90 calendar days and shall be submitted for acceptance within 30 calendar days after the Notice to Proceed is issued.
- B. Baseline Schedule with Narrative Report: Defines the Contractor's planned operations for the duration of the contract to completion, issuance of the Certificate of Substantial Completion and shall be submitted for acceptance within 90 calendar days after the Notice to Proceed is issued.

- C. Monthly Progress Schedules with Narrative Report: Indicates deviations from the Baseline Schedule and the preceding Monthly Progress Schedule and/or Recovery Schedule as applicable with Narrative Report. The narrative report should include, but not limited to, logic changes, added/deleted activities and justification for changes made. Monthly Progress Schedules with Narrative Report shall be submitted at the last Progress Meeting of the month.
- D. Recovery Schedules with Narrative Report: Indicates revisions to a Monthly Progress Schedule to regain contract compliance with Milestone dates, date of Substantial Completion, date of Contract Completion, and deviations from the Baseline Schedule. Recovery Schedules with Narrative Report shall be submitted before the first Progress Meeting of the month. Recovery Schedule with Narrative Report is required if the preceding Monthly Progress Schedule with recorded adverse weather exceeds the Baseline Schedule's Milestone dates, date of Substantial Completion, and/or date of Contract Completion by calendar days greater than the recorded adverse weather days.
- E. Two-Week Look-Ahead Report: Reports the activities of the previous 7 calendar days, approximate percentage of total activity completed to date, and manpower loading-by-trade; activities anticipated in the succeeding 7 calendar days; and activities in the succeeding 7 calendar days thereafter. The Two-Week Look-Ahead Report shall be submitted at each Progress Meeting. Two-Week Look-Ahead Report activities are to correlate to activities within the construction schedule, including additional detail as necessary.
- F. Schedule Manager Resume: Submitted by email for acceptance no later than 7 calendar days after the Notice to Proceed.
- G. Schedule submittals are to be submitted as a live file in .XML format as well as a PDF for reference.
- H. Submittal Procedure for Schedules: Submitted through the Schedule Approvals business process in the State's web-based project management system, OAKS Capital Improvements (OCI).

#### 1.04 QUALIFICATIONS

- A. Schedule Manager: Minimum 5 years' experience in critical path method scheduling using Oracle's Primavera P6 software.

#### 1.05 SCHEDULE KICK-OFF MEETING

- A. The purpose of the Schedule Kick-Off Meeting is to review the contract requirements for construction scheduling including, but not limited to:
  - 1. Applicable delivery method template
  - 2. Project calendars
  - 3. Project Level Activity Codes
  - 4. Minimum WBS breakdown
  - 5. Anticipated project work sequence
  - 6. Submission methodologies

## PART 2 PRODUCTS

### 2.01 SCHEDULE SOFTWARE

- A. The computer software utilized by the Schedule Manager to produce the project schedules will be Oracle's Primavera P6 software, version 6 or later.

## PART 3 EXECUTION

### 3.01 CRITICAL PATH METHOD

- A. The Critical Path Method (CPM) of network calculations will be used to generate the schedule. The Schedule Manager shall provide project schedules (Preliminary, Baseline, Progress Updates, Recovery, etc.) in .XML formatting as well as a .PDF for reference. Note: The required formatting may be waived by the Project Manager if the Contractor's proposed alternate formatting is supported by exceptional circumstances, i.e., short contract duration (less than six months) with a single trade.

### 3.02 SCHEDULE STRUCTURE

- A. With the exception of the Preliminary Schedule submission, the Construction Schedule shall include an appropriate level of detail. Failure of the Schedule Manager to develop or update the schedule or provide resource information will result in the schedule not being accepted.
  - 1. Provide a standard project calendar working day schedule that shows the various activities of work in sufficient detail to demonstrate a reasonable and workable plan to complete the work per the contract. Show the order and interdependence of activities and the sequence for accomplishing the work. Describe all activities in sufficient detail so that the Contracting Authority can readily identify the work and measure the progress of each activity. The Baseline Schedule must reflect the scope of work, required phasing, Owner requirements, Owner activities as predecessors to Contractor activities, interim Milestone completion dates (as needed), Substantial Completion Finish on or Before Milestone, the Contract Completion Finish on or Before Milestone, and other project milestones established in the Contract Documents. Include activities for critical project submittals, working drawings, shop drawing preparation, review and approval time for submittals and shop drawings, material procurement and fabrication, and the delivery of materials, plant, and equipment, and other similar activities.
  - 2. The Contractor shall be responsible for assuring all work, including all subcontractor work, is included in the Baseline Schedule. The Contractor shall be responsible for assuring that all work sequences are logical and that the schedule indicates a coordinated plan.
  - 3. Failure by the Contractor to include any element of work required for performance of the Contract shall not excuse the Contractor from completing all work within the required time. The Contracting Authority's review of the baseline schedule will be for compliance with the specifications and contract requirements. Acceptance by the Contracting Authority will not relieve the Contractor of any of their responsibilities for the accuracy or feasibility of the schedule. Omissions and errors will be corrected as described in Section F or I in this note and will not affect contract time.
- B. Activity Durations:
  - 1. Submit the following data to support the standard project calendar as it relates to durations. Failure of the Schedule Manager to include this data will delay the review of the submittal until the Contracting Authority receives the missing data.

- a. The proposed number of working days per week
- b. The holidays to be observed during the life of the contract (by day, month, and year)
- c. Exception dates set aside by the Owner as non-working days
- d. The planned number of shifts per day
- e. Break up the work into activities of a duration no longer than 20 workdays each, except as to non-construction activities (e.g., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities for which the contracting Authority may approve a longer duration.
- f. Activity durations will be in whole days, do not include decimals in the duration. Do not represent the Owner requirements, erosion control, and other similar items as single activities extending to the Substantial Completion date. Break these Contract Items into component activities.

C. Activity Logic:

1. All activities, except the first activity, shall have a predecessor(s). All activities, except the final activity, shall have a successor(s).
2. Use only finish to start relationships with no leads or lags to link activities or using start to start relationships with lags no greater than the predecessor duration to link activities.
3. Use of finish-to-finish relationships is permitted when both activities are already lined with a start to start relationship.

D. Procurement Activities:

1. Prepare the schedule in chronological order of critical submittals. Show specification section of the submittal, name of Contractor and generic description of work covered. Include activities to cover the complete procurement process to include submittal, review, approval, resubmittal, re-review, procurement, fabrication, delivery, permits, and similar pre-construction work.

E. Project Level Resources:

1. Activities shall include a primary resource of estimated budgeted units indicating man hours associated with each activity.
2. Identification of manpower, material, or equipment restrictions, as well as any activity requiring unusual shift work, such as two shifts per day, six-day work week, specified overtime, or work at times other than regular days or hours shall clearly be identified in the Project Schedule as needed.
3. Critical or near Critical Paths resulting from the use of manpower or equipment restraints shall be kept to a minimum. Near Critical Paths are defined as paths having 10 workdays or less of total float.

F. Project Level Activity Codes:

1. All activities shall be assigned, at a minimum, the following Project Level Activity Codes.
  - a. Responsibility indicating the party responsible to perform the work. Responsibility includes, but is not limited to, the contracting firm, the subcontracting firm, Contractor workforce or

Agency performing a given task. Activities shall not belong to more than one responsible party.

- b. Weather Dependent (Type 1, Type 2, or None)
- c. Off hour work or unique shifting requirements

G. Project Level Calendars:

1. Only project level calendars are to be utilized. All project level calendars are to be set with the detailed work hours/day calculating from 8 am-5 pm, with the noon hour break for lunch and shall inherit no exceptions or holidays from global calendars. The project level calendar names shall be utilized to identify specific planned work hours on site (4'10s, 5D, 6D, etc.) The contracting authority monitors progress on 1-day duration basis, it is the responsibility of the Contractor to execute the hours/resources needed to accomplish an activity in a given 1-day duration. No global data of any kind (codes, calendars, etc.) is to be used.

H. Activity Default Settings:

1. An activity should have the below default activity settings. Any variances must be approved by the Contracting Authority.
  - a. Activity Type: Task Dependent
  - b. Duration Type: Fixed Duration & Units
  - c. % Complete Type: Duration

I. Schedule Group and Sort Organization:

1. Arrange the schedule to show each major area of construction for each major category or unit of work by Work Breakdown Structure (WBS) or Project Level Activity Codes. The schedule organization should have a minimum of three levels.
2. All activity names shall include a reference to the group and sort associated which is agreed upon during the schedule kick off meeting. Activities shall not be allowed to cover more than one work area.

J. Change Order or Claim Number:

1. Any scope revision which modifies the critical path, or impacts an interim date, or Substantial Completion date must be represented in the schedule as a fragnet. A fragnet is defined as a sequence of new activities, to include the associated change identifier (PCO, CO, RFI, etc.), that are proposed to be added to the existing schedule. The fragnet shall identify the predecessors to the new activities and demonstrate the impacts to succeeding activities. The fragnet is to be added to the schedule at the progress update just prior to the known impact.

K. Milestones:

1. Milestone dates are required to be met by the Contractor. Time is of the essence for the completion of Milestones, Substantial Completion date, and for the Contract Completion date.
2. The following Milestone dates shall be adhered to by the Contractor (and Owner where specified):
  - a. **Milestone M1 (Owner Milestone)– April 01, 2022**



Site to be turned over to the contractor for commencement of on-site construction activity. Note that an area on site may be designated for material laydown and construction trailer mobilization prior to this milestone date subject to Owner approval.

b. **Milestone M2 – October 31, 2022**

*Substantial Completion in accordance with the General Conditions.*

c. **Milestone M3 – November 30, 2022**

Completion of all substantial completion punch list items.

L. Adverse Weather:

1. Definitions

- a. Adverse Weather Day: A day when the magnitude of a weather parameter (precipitation or temperature) is such that it creates conditions that inhibits the ability of the Contractor to work productively on critical construction activities.
- b. Expected Adverse Weather Days: The number of adverse weather days expected to occur on a monthly basis and defined for two different construction types (Type 1: Earth Moving and Type 2: Structures and Surfacing).
- c. Unexpected Adverse Weather Days: The number of adverse days that exceed the expected number of adverse weather days determined on a monthly basis. Also include number of days with lightning and/or high winds that inhibit the ability of the Contractor to work productively on critical construction activities as corroborated by the Contracting Authority. The Contractor is to notify the contracting authority within one month of a weather event.
- d. Actual Adverse Weather Days: The actual number of adverse weather days that occur during a single month.
- e. Precipitation: Rain, snow, or hail where 1” of rain equals 12” of snow.
- f. Calendar Day is based on all available days including weekends and holidays.
- g. Working Day is based on a five-day work week and excludes weekends and legal holidays.

2. Methodology

- a. Adverse Weather Days Criteria
  - 1) A single precipitation threshold of greater than 7.62 mm (0.30 in) determines an adverse weather day for Type 1 and Type 2 construction.
  - 2) A single precipitation threshold of greater than 19.05 mm (0.75 in) the previous day determines an adverse weather day/additional consecutive non-working day for Type 1 construction only.
  - 3) A single precipitation threshold of greater than 7.62 mm (0.30 inch) reached before shut-down determines an adverse weather day for Type 1 and Type 2 construction.
  - 4) A single daily maximum temperature threshold of less than 0 degrees C (32 degrees F) determines an adverse weather day for Type 1 & Type 2 construction.
  - 5) A combination of daily maximum temperature less than 0 degrees C (32 degrees F) and precipitation greater than 7.62 mm (0.30 inch) determines a single adverse weather day.
- b. Expected Adverse Weather Days

- 1) Calculate the average number of expected adverse weather calendar days per month based on 5 years of data from the nearest National Oceanic and Atmospheric Administration (NOAA) Land-Based Station for each construction type. Data can be found at the NOAA associated National Centers for Environmental Information (NCEI) web site at <https://www.ncei.noaa.gov/>.
- 2) Calculate the average number of expected adverse workdays per month by multiplying the average number of expected adverse weather calendar days per month by 5/7 and randomly, non-consecutive when possible, distribute the weather days throughout the project level weather calendars.

M. Scheduled Project Completion:

1. Project Start Date: The Construction Schedule may start no earlier than the date that the Notice to Proceed (NTP) was issued. The Schedule Manager shall include as the first activity in the Construction Schedule a Start Milestone called "Notice to Proceed." The "Notice to Proceed" activity shall have: a start constraint equal to the date that the NTP was issued.
2. Constraint of Last Activity: Completion of the last Finish Milestone in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the Critical Path. The Schedule Manager shall include as the last activity in the Project Schedule an activity called "Contract Complete". The completion milestones activity shall have a: Finish on or Before constraint, a constraint date equal to the Contract Completion milestone identified herein.
3. Project Details Must Finish By Date: The Schedule Manager shall set the "project details must finish by schedule date" to be equal to the "Contract Complete" date.

N. Interim Completion Dates (Milestones):

1. Contractually specified interim completion dates (Milestone dates) shall also be constrained to show negative float if early finish date of the last activity in that phase falls after the interim completion date.

O. Default Progress Data Disallowed:

1. Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in the CPM Scheduling Software. Actual Start and Finish dates and Remaining Durations on the CPM Schedule shall match those dates provided from Contractor Daily Reports for every in progress or completed activity and insure that the data contained on the Daily Reports is the sole basis for schedule updating. Failure to comply may result in the disapproval of schedule.

P. Out of Sequence Progress:

1. Activities that have posted progress without predecessors being completed (Out of Sequence Progress) shall be retained in the schedule only by the case by case concurrence of the Contracting Authority. The Contracting Authority may direct that changes in schedule logic be made to correct any or all Out of Sequence Work. Schedule must be calculated with the retained logic setting.

Q. Negative Lag(s):

1. Lag durations contained in the schedule shall not have a negative value unless approved by the Contracting Authority.

R. Definition of, and Conditions Relating to Float:

1. Float is defined as the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any activity in the schedule. Total float is defined as the amount of time any given activity or path of activities may be delayed before it will affect the project completion time.
2. Float is not time for the exclusive use or benefit of the Contractor and shall be used in the best interest of completing the project on time.
3. Extensions of Contract Times required under the General Conditions pertaining to equitable time adjustment will be granted only to the extent that the equitable time adjustment exceeds total float in the activity or path of activities affected at the time approval was issued for the change.
4. Use of float suppression techniques such as preferential sequences, special lead/lag logic restraints, extended activity times, or imposed dates, other than as required by the Contract, shall be cause for rejection of the Construction Schedule and any revisions or updates.

3.03 LAYOUTS / VIEWS

A. Each submitted schedule shall utilize the below layouts/views as stipulated by the Contracting Authority:

1. Preliminary Schedule Review
2. Baseline Schedule Review
3. Progress Review
4. Progress vs. Baseline Comparison
5. Progress vs. Previous Progress Comparison
6. Progress vs. Previous Progress vs. Baseline Comparison
7. Recovery Schedule vs. Previous Progress Comparison
8. Baseline Finish Date
9. Total Float
10. Actual Start and Actual Finish dates shall be printed for those activities in progress or completed

B. Activity ID Report: A list of all activities sorted according to Activity ID number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

C. Logic Report: A list of preceding and succeeding activities for every activity in ascending order by activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

- D. Total Float Report: A list of all activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates.

#### 3.04 90-DAY PRELIMINARY CONSTRUCTION SCHEDULE

- A. The accepted Preliminary Construction Schedule shall be used for payment purposes and the basis for measuring Contractor progress not to exceed 90 days after Notice to Proceed is issued.
- B. Schedule Review and Comments:
  - 1. Comments made by the Contracting Authority on the Preliminary Construction Schedule during review shall not relieve the Contractor from compliance with the requirements of the Contract Documents.
  - 2. Following the Contractor's receipt of the Contracting Authority's review comments, the Contractor shall correct the schedule to identify missing activities and relationships relevant to the Scope of Work. No time extensions will be granted to complete activities not initially included in the Contractor's Preliminary Construction Schedule.
  - 3. To the extent that there are any conflicts between the accepted Preliminary Construction Schedule and the requirements of the Contract Documents, the Contract Documents shall govern.
- C. Resubmittal of Preliminary Construction Schedule:
  - 1. Should the Contracting Authority reject the Preliminary Construction Schedule, the Schedule Manager shall comply with the Contracting Authority's direction and resubmit the Preliminary Construction Schedule and all associated submittals within seven calendar days.

#### 3.05 BASELINE CONSTRUCTION SCHEDULE

- A. The Contracting Authority shall accept or reject, in writing, the Baseline Construction Schedule and the associated submittals. If the Baseline Construction Schedule is rejected, the Contracting Authority shall provide comments in writing to the Schedule Manager stating the reasons why the submission was not accepted.
- B. Acceptance of the baseline schedule does not revise the Contract Documents. The baseline schedule must be "accepted" or "accepted as noted" by the Contracting Authority prior to the Contracting Authority evaluating any Contractor claims associated with time impacts.

#### 3.06 MONTHLY PROGRESS SCHEDULES

- A. Construction Contract Adjustment for Unexpected Adverse Weather:
  - 1. Contract adjustment is justified when the number of actual adverse weather workdays exceeds the expected number of adverse weather workdays over the life of the project.
  - 2. The number of actual adverse weather workdays as reported at the nearest NOAA Land-Based Station and related construction task(s) are to be reported on a monthly basis at the last Progress Meeting of the month as a condition of Payment Application approval.
  - 3. The Contracting Authority is to verify with documentation the actual adverse weather workdays reported by the Contractor.

4. Execution: At the first Progress Meeting of each month the total number of actual adverse weather days is compared to the expected number of adverse weather days and reported by the Contracting Authority. If the number of actual adverse weather days exceeds the expected amount, then the difference is the potential days for extensions of the Contract Times due to weather. A running total will be kept for every month of the entire project. Once the project Substantial Completion date is reached, or the number of working days is completed, the Contactor may request that any net positive adverse weather days for the running total be awarded as a time extension.

3.07 DATA SUBMISSION

- A. The preliminary, baseline, progress, and recovery Construction Schedules shall be provided in the form of a .XML file prepared in Oracle’s Primavera P6 software.

<b>Table 1 – Schedule Filename Convention</b>			
<b>Schedule</b>	<b>1st Submission</b>	<b>2nd Submission</b>	<b>3rd Submission</b>
Preliminary Schedule	YY.MM.DD_PPP-000000_01PS	YY.MM.DD_PPP-000000_02PS	YY.MM.DD_PPP-000000_03PS
Baseline Schedule	YY.MM.DD_PPP-000000_01B	YY.MM.DD_PPP-000000_02B	YY.MM.DD_PPP-000000_03B
Progress Schedule #1	YY.MM.DD_PPP-000000_01SU01	YY.MM.DD_PPP-000000_02SU01	YY.MM.DD_PPP-000000_03SU01
Progress Schedule #2	YY.MM.DD_PPP-000000_01SU02	YY.MM.DD_PPP-000000_02SU02	YY.MM.DD_PPP-000000_03SU02
Delay Analysis	YY.MM.DD_PPP-000000_01TIA01	YY.MM.DD_PPP-000000_02TIA01	YY.MM.DD_PPP-000000_03TIA01
Weather Delay Analysis	YY.MM.DD_PPP-000000_01WD01	YY.MM.DD_PPP-000000_02WD01	YY.MM.DD_PPP-000000_03WD01
Recovery Schedule	YY.MM.DD_PPP-000000_01RS01	YY.MM.DD_PPP-000000_02RS01	YY.MM.DD_PPP-000000_P03RS01
YY – Project Year MM – Month DD – Day PPP-000000 – Project Number			

3.08 APPROVED CHANGES VERIFICATION

- A. Only Construction Schedule changes that have been previously accepted by the Contracting Authority shall be included in the schedule submission. The narrative report shall specifically reference, on an activity-by-activity basis, all changes made since the previous period and relate each change to documented, accepted schedule changes.
- B. The Contractor shall prosecute the work in accordance with the accepted Construction Schedule. Out of sequence construction, defined as a change from the Construction Schedule in the Contractor’s actual operation requires prior concurrence from the Contracting Authority.
- C. Upon the approval of a Change Order or the issuance of a Change Directive by the Contracting Authority, the agreed upon change order activities, activity durations, logic and impacts shall be reflected in the next schedule submittal by the Schedule Manager.

- D. No change to the accepted activities, original activity durations, logic, interdependencies, milestones, planned sequence of operations, or resource loading of the Construction Schedule shall be made without prior approval from the Contracting Authority. If the Contractor desires to make a change to the accepted Construction Schedule, the Contractor shall outline the revisions made within the updated narrative, stating the reasons for the change as well as the specifics, such as the proposed changes in activities, original activity durations, logic, interdependencies, milestones, planned sequence of operations, or resource loading of the baseline Construction Schedule. The Contracting Authority shall respond within three calendar days after the receipt of the Contractor's request.
- E. If the Contracting Authority considers the Construction Schedule change requested by the Contractor to be a major change, it may require the Contractor to revise and submit for acceptance, without additional cost to the Owner, all of the affected portions of the network diagrams, and any schedule reports, or construction equipment reports deemed necessary to show the probable effect on the entire project. The proposed network revision and required reports shall be submitted to the Contracting Authority within seven calendar days after the Contracting Authority notifies the Contractor that the requested revision is a major change. Only upon the approval of the requested change by the Contracting Authority may it be reflected in the next Construction Schedule update submitted by the Contractor.
- F. A change will be considered of a major nature if the time estimated for an activity or sequence of activities is varied from the original plan to the degree that there is reasonable doubt that the Substantial Completion date, Contract Completion date, or milestones will be met, or if the change impacts the work of Separate Contractors at the job site. Changes to activities having adequate float may be considered as minor changes, except that an accumulation of minor changes may be considered a major change when such changes affect the Substantial Completion date, Contract Completion date, or milestones.

END OF SECTION 013216



## SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Submittal schedule requirements.
  - 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
  - 1. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
  - 2. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
  - 3. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
  - 4. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

#### 1.3 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."

#### 1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list 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. Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
3. 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 dates for installation.
  - h. Activity or event number.

## 1.5 SUBMITTAL FORMATS

### A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

### B. Options: Identify options requiring selection by Architect.

### C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on

previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2. Provide a space approximately 6 by 8 inches (150 by 200 mm on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using Contractor's standard transmittal form.

E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

F. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

## 1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Will not be accepted.
2. Web-Based Project Software (Required): Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
3. Paper (Physical Samples Only): Prepare submittals in paper form, and deliver to Architect. Upload pdf copy to web-based project software for record.

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 submittals for related parts of the Work specified in different Sections 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 14 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 14 days for review of each resubmittal.
- D. 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.
- E. 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.
- F. 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.

#### 1.7 SUBMITTAL REQUIREMENTS

- A. 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 unsuitable 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 that show 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 Shop Drawings, and before or concurrent with Samples.
- B. 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.
  - 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. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
  - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.
  - 3. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Include digital image file illustrating Sample characteristics, and identification information for record. Enter required data in web-based software site to fully identify submittal.
  - 4. Paper Transmittal: Include paper transmittal including complete submittal information indicated.

5. 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.
  6. 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.
  7. 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. Architect will retain one Sample set; 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.
- D. Product Schedule: As specified 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.
- E. 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.

- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
  2. 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.
  3. 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.
  4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
  5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
  6. 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.
- H. Test and Research Reports:
1. 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.
  2. 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.
  3. 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.
  4. 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.
  5. 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.
  6. 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:
    - a. Name of evaluation organization.

- b. Date of evaluation.
- c. Time period when report is in effect.
- d. Product and manufacturers' names.
- e. Description of product.
- f. Test procedures and results.
- g. Limitations of use.

#### 1.8 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 insufficient 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 file 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.

#### 1.9 CONTRACTOR'S REVIEW

- A. Action Submittals 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.
  - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

#### 1.10 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
  - 1. Software: Architect will indicate, on Project software website, the appropriate 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. Architect return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300





## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection 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 quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-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.

#### 1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described 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.
- B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. 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, assembly, 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).
  - D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and 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. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.
  - E. 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.
  - F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
  - G. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
  - H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
  - I. 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.
  - J. 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. Contractor's quality-control services do not include contract administration activities performed by Architect.
- 1.4 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.

## 1.5 CONFLICTING REQUIREMENTS

- A. **Conflicting Standards and Other Requirements:** If compliance with two or more standards or requirements are specified and the standards or requirements 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 direction 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.

## 1.6 ACTION SUBMITTALS

- A. **Shop Drawings:** For mockups.
  - 1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
  - 2. Indicate manufacturer and model number of individual components.
  - 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. **Delegated-Design Services Submittal:** In addition to Shop Drawings, Product Data, and other required submittals, submit a statement 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

## 1.7 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 submitted to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
  - 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

- 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.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, 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.

#### 1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan 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 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 may also serve as Project superintendent.
- 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. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.

- 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.

## 1.9 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, telephone number, and email address 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 inspection.
  - 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, telephone number, and email address 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, telephone number, and email address 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.

#### 1.10 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- 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, applying, 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 inspection indicated, as documented according to ASTM E329 and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- 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 and test assemblies, and standalone 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, 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 of size indicated.
  - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
  - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
  - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  - 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 8. 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. Comply with requirements in "Mockups" Paragraph.

- M. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

#### 1.11 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, the A/E will engage a qualified testing agency to perform these services.

1. A/E will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances included in the A/E contract.
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, whether specified or not, to verify and document that the Work complies with requirements.

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. Engage a qualified testing agency to perform quality-control services.
  - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection 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 inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

- C. 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.

- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations 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 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 duties of Contractor.
- E. **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."
- F. **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.
- G. **Associated Contractor Services:** Cooperate with agencies and representatives 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 inspection. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  6. Security and protection for samples and for testing and inspection equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
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. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.
1. **Distribution:** Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

## 1.12 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections attached to this Section, and as follows:
1. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  2. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  5. Retesting and reinspecting corrected work.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 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 reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

### 3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, 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."
- B. Protect construction exposed by or for quality-control service activities.

- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000





### Statement of Special Inspections

State CPA No.: \_\_\_\_\_  
 Project Name: DOT-200023 ODOT - EATON OUTPOST  
 Project Location: 5656 US-127 Eaton, Ohio 45320

Pursuant to section 1704.2.3 Ohio Building Code, this statement of special inspections must be prepared by the applicant acting as the owner’s agent. This statement (2-part documents) should be submitted as a condition for plan approval and should include the following:

- **Part I:** A complete list of materials and work requiring special inspections and the required frequency of inspections by sections 1705.1 through 1705.18 Ohio Building Code.
- **Part II:** A list of special inspectors who are qualified and are competent to the particular type of construction or operations. **These special inspectors shall be employed by the owner or owner’s representative, other than contractor. Submit proper resumes and/or certificates of the special inspectors.**

\*\* Please mark “X” on all work items requiring special inspection and the required frequency of inspections for this project per requirements in section 1705 OBC.

PART I: SCHEDULE OF SPECIAL INSPECTIONS				
No.	ITEM	Req'd	Continuous Inspection	Periodic Inspection
1	Special cases: (1705.1.1 OBC) Adhesive Anchors	X		X
2	Steel Construction (1705.2 OBC)			
	▪ Structural steel			
	▪ Cold form steel deck			
	▪ Open-web steel joists and joist girders			
	▪ Cold form steel trusses spanning ≥ 60 feet			
3	Concrete construction (1705.3 OBC)	X	X	X
	▪ Welding reinforcing bars			
	▪ Material tests	X	X	X
4	Masonry Construction (1705.4 OBC)			
	▪ Empirically designed in risk category 4			
	▪ Vertical masonry foundation elements			
5	Wood Construction (1705.5 OBC)	X		X
	▪ High-load diaphragms			

See Sheet S-001 for an itemized list.

	▪ Wood trusses spanning $\geq$ 60 feet			
6	Soils (1705.6 OBC)	X	X	X
7	Driven Deep Foundation (1705.7 OBC)			
8	Cast-In-Place Deep Foundation (1705.8 OBC)			
9	Helical Pile Foundation (1705.9 OBC)			
10	Fabricated items (1705.10 OBC)			
11	Wind resistance (1705.11 OBC)			
	▪ Structural wood			
	▪ Cold-form steel light framed construction			
	▪ Wind resisting components			
12	Seismic resistance (1705.12 OBC)			
	▪ Structural steel			
	▪ Structural wood			
	▪ Cold-formed steel light-frame construction			
	▪ Designated seismic systems			
	▪ Architectural components			
	▪ Plumbing, mechanical, electrical components			
	▪ Storage racks			
	▪ Seismic isolation systems			
	▪ Cold-form steel special bolted moment frame			
13	Testing for seismic resistance (1705.13 OBC)			
	▪ Structural steel			
	▪ Nonstructural components			
	▪ Designated seismic systems			
	▪ Seismic isolation systems			
14	Sprayed fire-resistant materials (1705.14 OBC)			
	▪ Physical & visual tests			
	▪ Structural member surface conditions			
	▪ Application			
	▪ Thickness			
	▪ Density			
	▪ Bond strength			
15	Fire resistant coatings (1705.15 OBC)			
16	EFIS system (1705.16 OBC)			
	▪ Water resistive barrier coating			

17	Fire-resistant penetration/joint (1705.17 OBC)			
	▪ Penetration firestops			
	▪ Fire-resistant joint systems			
18	Testing for smoke control (1705.18 OBC)			
	▪ Testing scope			
	▪ Qualifications			

- Submit the resume of special inspectors for all marked special inspection items in the part I table showing the qualification and/or special training per 1704.1 OBC.

PART II: LIST OF SPECIAL INSPECTORS			
No.	ITEM	Inspection Company	Name of Inspector
1	Special cases: (1705.1 OBC)		
2	Steel Construction (1705.2 OBC)		
3	Concrete construction (1705.3 OBC)		
4	Masonry Construction (1705.4 OBC)		
5	Wood Construction (1705.5 OBC)		
6	Soils (1705.6 OBC)		
7	Driven Deep Foundation (1705.7 OBC)		
8	Cast-In-Place Deep Foundation (1705.8 OBC)		
9	Helical Pile Foundation (1705.9 OBC)		



10	Fabricated items (1705.10 OBC)		
11	Wind resistance (1705.11 OBC)		
12	Seismic resistance (1705.12 OBC)		
13	Testing for seismic resistance (1705.13 OBC)		
14	Sprayed fire-resistant materials (1705.14 OBC)		
15	Mastic & intumescent fire- resistant coatings (1705.15 OBC)		
16	EFIS system (1705.16 OBC)		
17	Fire-resistant penetrations and joints (1705.17 OBC)		
18	Testing for smoke control system (1705.18)		

**The above statement of special inspections has been prepared by the applicant in accordance with the provision of section 1704.3 Ohio Building Code 2017.**

**The project registered design professional in responsible charge also acknowledges that he or she is responsible for reviewing and approving the special inspection reports submitted by the special inspectors at the required inspection periods. Any discrepancies in special inspection reports shall be brought to the attention of the building official. A final special inspection report documenting required special inspections and tests, and corrections of any discrepancies noted in the inspections or tests shall be submitted at a point of time agreed upon prior to the start of work by the owner or the owner's representative to the building official prior to the issuance of the certificate of occupancy.**

**Project applicant:**

Name of Applicant: Jeffrey E. McCutchen

Name of Company: Paul J. Ford & Company

Signature: 

Date: 11/12/2021

**Property Owner:**

Name of Owner: Sulaiman Bah

Name of Company: Ohio Department of Transportation

Signature: *Sulaiman Bah*

Date: 11-12-21



## SECTION 014200 - REFERENCES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

#### 1.3 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.

#### 1.4 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 indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. 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. **[Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." ]**The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
2. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
7. ABMA - American Boiler Manufacturers Association; [www.abma.com](http://www.abma.com).
8. ACI - American Concrete Institute; (Formerly: ACI International); [www.concrete.org](http://www.concrete.org).
9. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
11. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
12. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
13. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
15. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
16. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
17. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
18. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
19. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
20. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
21. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
22. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
23. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
24. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).

25. API - American Petroleum Institute; [www.api.org](http://www.api.org).
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
29. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
32. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
33. ASSE - American Society of Safety Engineers (The); [www.asse.org](http://www.asse.org).
34. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
35. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
36. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
37. AWEA - American Wind Energy Association; [www.awea.org](http://www.awea.org).
38. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
40. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
41. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
42. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
43. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
44. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
45. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.org](http://www.bifma.org).
47. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); [www.bissc.org](http://www.bissc.org).
49. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
50. CE - Conformite Europeenne; <http://ec.europa.eu/growth/single-market/ce-marking/>.
51. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
52. CEA - Consumer Electronics Association; [www.ce.org](http://www.ce.org).
53. CFFA - Chemical Fabrics and Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
54. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
55. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
56. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
57. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
58. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
59. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
60. CPA - Composite Panel Association; [www.pbmdf.com](http://www.pbmdf.com).
61. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
62. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).
63. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
64. CSA - CSA Group; [www.csagroup.com](http://www.csagroup.com).
65. CSA - CSA International; [www.csa-international.org](http://www.csa-international.org).
66. CSI - Construction Specifications Institute (The); [www.csinet.org](http://www.csinet.org).
67. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.cti.org](http://www.cti.org).
69. CWC - Composite Wood Council; (See CPA).

70. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
71. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
74. ECIA - Electronic Components Industry Association; [www.eciaonline.org](http://www.eciaonline.org).
75. EIA - Electronic Industries Alliance; (See TIA).
76. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
77. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
78. ESD - ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); [www.intertek.com](http://www.intertek.com).
81. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
82. FCI - Fluid Controls Institute; [www.fluidcontrolsinstitute.org](http://www.fluidcontrolsinstitute.org).
83. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); [www.fiba.com](http://www.fiba.com).
84. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); [www.fivb.org](http://www.fivb.org).
85. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
86. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
87. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; [www.floridarooft.com](http://www.floridarooft.com).
88. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
89. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
90. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
91. GANA - Glass Association of North America; [www.glasswebsite.com](http://www.glasswebsite.com).
92. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
93. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
94. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
95. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
96. HPVA - Hardwood Plywood & Veneer Association; [www.hpva.org](http://www.hpva.org).
97. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
98. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
99. IAS - International Accreditation Service; [www.iasonline.org](http://www.iasonline.org).
100. ICBO - International Conference of Building Officials; (See ICC).
101. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
102. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
103. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
104. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
105. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
106. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
107. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).
108. IESNA - Illuminating Engineering Society of North America; (See IES).
109. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
110. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).
111. IGSHA - International Ground Source Heat Pump Association; [www.igshpa.okstate.edu](http://www.igshpa.okstate.edu).
112. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).
113. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).

114. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
115. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
116. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
117. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
118. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
119. ITU - International Telecommunication Union; [www.itu.int/home](http://www.itu.int/home).
120. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
121. LMA - Laminating Materials Association; (See CPA).
122. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
123. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
124. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
125. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
126. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
127. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
128. MIA - Marble Institute of America; [www.marble-institute.com](http://www.marble-institute.com).
129. MMPA - Moulding & Millwork Producers Association; [www.wmmpa.com](http://www.wmmpa.com).
130. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
131. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
132. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
133. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
134. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
135. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
136. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
137. NBI - New Buildings Institute; [www.newbuildings.org](http://www.newbuildings.org).
138. NCAA - National Collegiate Athletic Association (The); [www.ncaa.org](http://www.ncaa.org).
139. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
140. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
141. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
142. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
143. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
144. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
145. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
146. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
147. NFPA - NFPA International; (See NFPA).
148. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
149. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
150. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
151. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
152. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
153. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
154. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
155. NSF - NSF International; [www.nsf.org](http://www.nsf.org).
156. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
157. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
158. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
159. NWFA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).



160. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
161. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
162. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
163. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
164. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
165. RIS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
166. SAE - SAE International; [www.sae.org](http://www.sae.org).
167. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
168. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
169. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
170. SEFA - Scientific Equipment and Furniture Association (The); [www.sefalabs.com](http://www.sefalabs.com).
171. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
172. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
173. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
174. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
175. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
176. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
177. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
178. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
179. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
180. SRCC - Solar Rating & Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
181. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
182. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
183. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
184. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
185. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
186. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
187. TCNA - Tile Council of North America, Inc.; [www.tileusa.com](http://www.tileusa.com).
188. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
189. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
190. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
191. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
192. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
193. TPI - Turfgrass Producers International; [www.turfgrasssod.org](http://www.turfgrasssod.org).
194. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
195. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
196. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
197. USAV - USA Volleyball; [www.usavolleyball.org](http://www.usavolleyball.org).
198. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
199. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).
200. WA - Wallcoverings Association; [www.wallcoverings.org](http://www.wallcoverings.org).
201. WASTEC - Waste Equipment Technology Association; [www.wastec.org](http://www.wastec.org).
202. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
203. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
204. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).

205. WI - Woodwork Institute; [www.wicnet.org](http://www.wicnet.org).
206. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
207. WWPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

C. 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.

1. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).
2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

D. 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.

1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
4. DOD - Department of Defense; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
7. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
8. FG - Federal Government Publications; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
9. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
10. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; [www.eetd.lbl.gov](http://www.eetd.lbl.gov).
12. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
13. SD - Department of State; [www.state.gov](http://www.state.gov).
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; [www.trb.org](http://www.trb.org).
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
18. USP - U.S. Pharmacopeial Convention; [www.usp.org](http://www.usp.org).
19. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).

E. 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.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).

2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
  3. DSCC - Defense Supply Center Columbus; (See FS).
  4. FED-STD - Federal Standard; (See FS).
  5. FS - Federal Specification; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.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](http://www.wbdg.org).
  6. MILSPEC - Military Specification and Standards; (See DOD).
  7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
  8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. 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.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; [www.bearhfti.ca.gov](http://www.bearhfti.ca.gov).
  2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.calregs.com](http://www.calregs.com).
  3. CDHS; California Department of Health Services; (See CDPH).
  4. CDPH; California Department of Public Health; Indoor Air Quality Program; [www.cal-iaq.org](http://www.cal-iaq.org).
  5. CPUC; California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
  6. SCAQMD; South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).
  7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; [www.txforestservation.tamu.edu](http://www.txforestservation.tamu.edu).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
  - 2. Section 312000 "Earth Moving" for disposal of ground water at Project site.

#### 1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, Owner representatives, Contracting Authority, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- E. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- F. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.
- G. 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. 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.

## 1.5 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.
- C. Accessible Temporary Egress: Comply with applicable provisions in ICC/ANSI A117.1.

## 1.6 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

### 2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts;

minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.

- B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E84 and passing NFPA 701 Test Method 2.
- D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats minimum 36 by 60 inches (914 by 1524 mm).
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

## 2.2 TEMPORARY FACILITIES

- A. 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 and chairs, and full wi-fi capabilities with sufficient bandwidth to conduct virtual meetings.
  - 3. Drinking water.
  - 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
  - 5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- B. Temporary facilities and controls in the Contract include, but are not limited to the following:
  - 1. Temporary facilities and controls.
  - 2. Sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. (Store combustible materials apart from building.)
  - 3. Temporary Sediment and erosion control.
  - 4. Temporary drainage, including drainage ditches, dry wells, stabilization ponds, and containers.
  - 5. Storm water control.
  - 6. Temporary toilet fixtures, wash facilities, and drinking water facilities, including disposable supplies.
  - 7. Temporary enclosure for building exterior, except as indicated.
  - 8. Temporary roads and paved areas.
  - 9. Dewatering facilities and drains.

10. Excavation support and protection, unless required solely for the Work of another contract.
11. Special or unusual hoisting requirements for construction activities, including hoisting loads in excess of 2 tons(2000 kg), hoisting material or equipment into spaces below grade, and hoisting requirements outside building enclosure.
12. Project identification and temporary signs.
13. General waste disposal facilities.
14. Pest control.
15. Temporary fire-protection equipment.
16. Barricades, warning signs, and lights.
17. Site enclosure fence.
18. Security enclosure and lockup.
19. Environmental protection.
20. Keep State and/or County access roads at the project site clean of mud, construction debris and other items related to this project. Problems that occur are to be addressed immediately upon notification by State of Ohio or local officials.
21. Piped gas service.
22. Electric power service and distribution.
23. Data/Communication service and distribution
24. Lighting, including site lighting.

### 2.3 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

#### 3.1 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.
  - 1. Locate facilities to limit site disturbance.
- 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.

#### 3.2 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. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. 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.
- F. Temporary Heating and Cooling: Provide temporary heating and cooling 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.
  - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.



- 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.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment.
- J. Electronic Communication Service: Equip field office with not less than the following:
  - 1. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
  - 2. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum **1.0** Mbps upload and **15** Mbps download speeds.
  - 3. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.

### 3.3 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 (9 m) of building lines that is noncombustible according to ASTM E136. 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 property limits unless otherwise approved.
  - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment to minimize dust.
- C. Temporary Use of Planned 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.
  - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course

pavement before installation of final course according to Section 321216 "Asphalt Paving."

- 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 to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. Identification Signs:
    - a. Project identification signs not required.
    - b. Contractor advertising signs will not be permitted.
  - 2. Temporary Signs: Provide other signs as indicated to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  - 3. Maintain and touch up signs so they are legible at all times.
- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

### 3.4 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.
  - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

- 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 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
  - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
  - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
  - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
  - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- E. 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.
- F. Tree and Plant Protection: Provide adequate protection to ensure any trees or plants designated to remain are in a condition equal to or better than when construction commences. Failure to adequately protect will necessitate contractor to replace designated tree or plant with like variety and maturity subject to approval of Owner and Architect.
- G. Tree and Plant Protection: Install temporary fencing located outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- H. 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 materials approved by authorities having jurisdiction.
- A. Site Enclosure Fence: Existing site includes a perimeter enclosure fence and gate. Contractor is not required to provide additional perimeter fencing.
  - 1. If construction scope and/or operations requires temporary removal of any segment of existing perimeter fencing, the contractor shall provide and install temporary security fencing until the permanent fence has been restored.

- B. 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 workday.
- C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- E. 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.
- F. 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. Comply with additional limits on smoking specified in other Sections.
  - 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.
  - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
  - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
  - 2. 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.
  - 3. Indicate methods to be used to avoid trapping water in finished work.
- B. Exposed Construction Period: 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 Period: 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 and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: 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 temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
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 hours are considered defective and require replacing.
  - 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. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
  - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

### 3.6 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. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

- D. 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 016000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for products selected under an allowance.
  - 2. Section 012300 "Alternates" for products selected under an alternate.
  - 3. Section 012500 "Substitution Procedures" for requests for substitutions.
  - 4. Section 014200 "References" for applicable industry standards for products specified.

#### 1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual



characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

#### 1.4 ACTION SUBMITTALS

- A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
    - a. Form of Architect's Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
    - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

#### 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
  - a. Name of product and manufacturer.
  - b. Model and serial number.
  - c. Capacity.
  - d. Speed.
  - e. Ratings.
3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

#### 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
  1. Store products to allow for inspection and measurement of quantity or counting of units.
  2. Store materials in a manner that will not endanger Project structure.
  3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  6. Protect stored products from damage and liquids from freezing.
  7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

## 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  - 4. Where products are accompanied by the term "as selected," Architect will make selection.
  - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
  - 1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

- a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: ..."
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: ..."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered following the bid period. Refer to Instructions to Bidders Article 2.5.
  - a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: ..."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.
  - a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: ..."
5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered following the bid period. Refer to Instructions to Bidders Article 2.5.
  - a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: ..."
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
  - a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: ..."
7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
  2. Evidence that proposed product provides specified warranty.
  3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  4. Samples, if requested.
- B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 016000.1 PRODUCT APPROVAL REQUEST FORM

TO: **Jerome M. Scott Architects Inc,**  
1020 Goodale Blvd.  
Columbus, Ohio 43212

PROJECT: **ODOT – Eaton Outpost**  
Project No. DOT-200023  
Date: \_\_\_\_\_

Product Approval Request Philosophy: To provide appropriate materials, products, and systems which, in the best interest of the Contracting Authority, are compatible with the design philosophy and budget established for the Project.

Requirements and guidelines for standards/substitutes are indicated in Instructions to Bidders, General Conditions, Special Conditions and Supplementary Special Conditions.

**THE FOLLOWING REQUEST FORM SHALL BE FILLED OUT COMPLETELY, CLEARLY, AND CONCISELY OR IT WILL NOT BE REVIEWED.**

SPECIFIED MANUFACTURER AND PRODUCT ITEM: \_\_\_\_\_ Section  
Page \_\_\_\_\_ Paragraph \_\_\_\_\_

The undersigned requests consideration of the following manufacturer and product. Clearly indicate model number or system proposed:

PROPOSED MANUFACTURER AND PRODUCT ITEM: \_\_\_\_\_

The attached technical data includes product description, specifications, and drawings with applicable portions of the data identified for evaluation of the product approval request. Include, when appropriate or when requested by A/E, samples, photographs, and performance and test data, to fully describe proposed product. Attached data also includes a description of changes to the Contract Documents required for the proper installation of the proposed product. **If technical data is not attached, the proposed manufacturer and product will be rejected due to insufficient information available for evaluation.**

In order to expedite comparison and evaluation, the submitter shall compare the proposed product on a line-by-line basis to the specified requirements. Reference section article numbers and paragraphs.

Submitter shall respond to the following questions. Provide appropriate substantiating data for evaluation.

YES NO ATTACHMENT

- Is product represented locally?  
Supplier/Representative:
- Is an approved installer required?
- Are approved installer(s) available locally?  
Approved Installer(s):
- Is the submitted product equivalent to the specified item?
- Does it have the same dimensions? (Thickness, gage, etc.)
- Does it have the same appearance?
- Does it comply with the same quality standards listed? (ANSI, ASME, etc.)
- Does it have similar color selections available as specified product?
- Has the proposed product been used locally?

- Does the proposed product affect construction details?
- Is construction time affected?
- Is proposed product warranty equal to specified warranty?
- Does proposed product manufacturer have a record of standing behind its product and warranty?

The undersigned certifies the following statements are correct, unless specifically noted on the attachments:

1. The proposed product does not affect dimensions shown on the Drawings.
2. The undersigned will pay for changes to the building design, including architectural and engineering design, detailing, and construction costs caused by the use of the proposed product.
3. The proposed product meets specified requirements.
4. The proposed product will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
5. Maintenance and service parts will be locally available for the proposed product.

The undersigned further states that the function, appearance, and quality of the proposed product are equivalent or superior to the specified item.

Submitted by: \_\_\_\_\_

Signature \_\_\_\_\_

Typed Name: \_\_\_\_\_

Firm: \_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

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

Attachments (List): \_\_\_\_\_

\_\_\_\_\_

END OF PRODUCT APPROVAL REQUEST FORM

## SECTION 017300 - EXECUTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 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:
  - 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, replacing defective work, and final cleaning.

#### 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

#### 1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.



1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
  - a. Contractor's superintendent.
  - b. Trade supervisor responsible for cutting operations.
  - c. Trade supervisor(s) responsible for patching of each type of substrate.
  - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affecting by cutting and patching operations.
2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 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 digital copy signed by land surveyor.
- F. Final Property Survey: Submit digital copy showing the Work performed and record survey data.

1.6 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. Plumbing piping systems.
    - f. Mechanical systems piping and ducts.
    - g. Control systems.
    - h. Communication systems.
    - i. Fire-detection and -alarm systems.
    - j. Conveying systems.
    - k. Electrical wiring systems.
    - l. 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. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.1 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 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

### 3.1 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.

### 3.2 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 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."

### 3.3 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 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 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 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.

### 3.4 FIELD ENGINEERING

- A. 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. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. 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.
- C. 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.
- D. 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."

### 3.5 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 (2440 mm) in occupied spaces and 90 inches (2300 mm) 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: Where possible, select tools or equipment that minimize production of excessive 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 portions of the 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. Repair or remove and replace damaged, defective, or nonconforming Work.
  - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

### 3.6 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 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.

### 3.7 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.

### 3.8 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 (27 deg C).
  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 015000 "Temporary Facilities and Controls."
- 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 ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. 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. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300



## SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 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. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
  - 2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at final completion.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 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 a minimum of 10 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, 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 Architect. Label with manufacturer's name and model number.

- 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 Architect's signature for receipt of submittals.

5. Submit testing, adjusting, and balancing records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 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 utility services.

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.
  10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion 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 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. 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.

#### 1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. All items in accordance with Article 6.25.2 of the General Conditions
- 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. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.8 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.
  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. MS Excel electronic file or PDF electronic file. Architect will return annotated file.

#### 1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  1. Submit on digital media acceptable to Architect.
- E. Warranties in Paper Form:
  1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 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.
  - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

## PART 3 - EXECUTION

### 3.1 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 cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - 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 not planted, mulched, or 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; clean according to manufacturer's recommendations 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. 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 and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    - 1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.
  - p. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
  - q. 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 015000 "Temporary Facilities and Controls."

### 3.2 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



## SECTION 017823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Emergency manuals.
  - 3. Systems and equipment operation manuals.
  - 4. Systems and equipment maintenance manuals.
  - 5. Product maintenance manuals.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

#### 1.3 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.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized in accordance with this Section.
  - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:

1. Submit digital copy by uploading to web-based project software site. Enable reviewer comments on draft submittals.
  2. Submit up to three paper copies as requested by the Owner.
- C. Preliminary Manual Submittal: Submit outline copy of each manual at 50% completion of the construction schedule. Architect 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. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual as a condition precedent to execution of the Certificate of contract completion and final payment in accordance with the General Conditions.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

#### 1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. 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: Bookmark 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.
- B. 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 with pocket folders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) 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. 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. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) 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.

## 1.6 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

- A. Organization of Manuals: 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 Construction Manager.
  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. 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."

## 1.7 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
  - 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.
- B. 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.
- C. 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.
- D. 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.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

#### 1.8 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
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.
- B. 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 warranties and bonds as described below.
- C. 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.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; 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.
    - a. 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.



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.
- E. 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.
- F. 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.
- G. 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.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. 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.
- J. 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 maintenance manuals.
- 1.9 PRODUCT MAINTENANCE MANUALS
- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. 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 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823



## SECTION 017839 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
- B. Related Requirements:
  - 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.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned record prints.
      - 2) Print each drawing, whether or not changes and additional information were recorded.

#### 1.4 RECORD DRAWINGS

- A. Record Prints: 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. Preparation: 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 photographic documentation.
2. Content: 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.
  - 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.
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.
4. Mark record sets with erasable, red-colored pencil. Use other 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 Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

#### 1.5 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store record documents 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 reference during normal working hours.

ODOT - EATON OUTPOST  
DOT-200023

Jerome M. Scott Architects, Inc.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839



## SECTION 017900 - DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
  - 1. In the event of a conflict between articles in this section and the General Conditions, the General Conditions shall govern.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration and training in operation and maintenance of systems, subsystems, and equipment.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For facilitator, instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.

#### 1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.



## 1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

## 1.6 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections and outlined herein.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  - 2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Systems and equipment operation manuals.
    - c. Systems and equipment maintenance manuals.
    - d. Product maintenance manuals.
    - e. Project Record Documents.
    - f. Identification systems.
    - g. Warranties and bonds.
    - h. Maintenance service agreements and similar continuing commitments.
  - 3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.

- d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning.
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Architect, with at least 30 days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.9 DEMONSTRATION AND TRAINING

- A. General: Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. Demonstrations must be scheduled with the ODOT District to occur over a period of three consecutive days.
  - 1. At the beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Systems for Demonstration and Training:
  - 1. Gas Detection System
  - 2. Electrical Systems and Controls for all Buildings and Site (Fire Alarm, power, data, lighting, etc.)
  - 3. Generator (if applicable)
  - 4. Wash Bay Equipment
  - 5. HVAC Systems and Controls (radiant heaters, makeup air units, exhaust fans, etc.)

6. Plumbing Systems [(wet - heater, fixtures, etc.), (air – drops, compressor, etc.), and gas]
7. Overhead Doors
8. Shut-off valves
9. S2 Access Control and DMP Intrusion

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900



## SECTION 02 41 00 - SITE DEMOLITION

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Demolition of buildings, foundations, utility structures, paving, utilities, and associated items.
2. Filling voids created as a result of removals or demolition.

##### B. Related Requirements:

1. Section 31 10 00 – Site Clearing
2. Section 31 20 00 – Earthwork
3. Section 31 25 00 – Erosion & Sediment Controls

#### 1.2 REGULATORY REQUIREMENTS

- A. Conform to applicable State and local codes for demolition of structures, safety of adjacent structures, dust control, runoff control, and pollution prevention.
- B. Obtain required permits and licenses from appropriate authorities. Pay associated fees including disposal charges.
- C. Notify affected utility companies before starting work and comply with their requirements.
- D. Do not close or obstruct public or private roadways, sidewalks, or fire hydrants without appropriate permits or written authorization.
- E. If hazardous, contaminated materials, or other environmental related conditions are discovered, stop work immediately and notify the Architect for action to be taken. Do not resume work until specifically authorized by the Architect.
- F. Test soils around buried tanks for contamination. Coordinate notification for mobilization to site and required observation of tank removal with Architect.

#### 1.3 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of capped utilities and subsurface obstructions that will remain after demolition. Submit record as part of closeout submittals.

#### 1.4 PROJECT CONDITIONS

- A. Structures to be demolished will be discontinued in use and vacated prior to start of work.

- B. Owner assumes no responsibility for condition of structures to be demolished.
- C. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as reasonably practical. Variations within structures may occur by Owner's removal and salvage operations prior to start of demolition work.
- D. Unless otherwise indicated in Contract Documents or specified by the Owner, items of salvageable value to Contractor shall be removed from site and structures. Storage or sale of removed items on site will not be permitted and shall not interfere with other work specified.
- E. Explosives shall not be brought to site or used.

## PART 2 - PRODUCTS

### 2.1 FILL MATERIALS

- A. Fill material shall be as specified in Section 31 20 00 Earthwork.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Provide, erect, and maintain erosion control devices, temporary barriers, and security devices at locations indicated on Construction Drawings.
- B. Protect existing landscaping materials, appurtenances, and structures, which are not to be demolished. Repair damage to existing items to remain caused by demolition operations. Repair shall meet or exceed existing conditions and shall be coordinated with the Architect.
- C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring as necessary.
- D. Mark location of utilities. Protect and maintain in safe and operable condition utilities that are to remain. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities and Owner.
- E. Notify adjacent property owners of work that may affect their property, potential noise, utility outages, or other disruptions. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon, or limit access to their property. Coordinate notice with Owner.
- F. Existing Utilities: Locate, identify, disconnect, and seal or cap off at source indicated utilities serving buildings and utility structures to be demolished.
  - 1. Contractor shall arrange to shut off indicated utilities with respective utility companies.
  - 2. If removal or relocation of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
  - 3. Remove utilities to source per the requirements of the authorities having jurisdiction.

4. Where utilities are removed, also remove all protective encasements and conduit.
- G. Existing Utilities: Do not start demolition work until utility disconnecting, sealing and removal to source have been completed and verified in writing.

### 3.2 GENERAL DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with adjacent buildings or pavements to remain.
- B. Cease operations immediately if adjacent buildings appear to be in danger. Notify Architect. Do not resume operations until approved by Architect.
- C. Conduct operations with minimum of interference to public or private access. Maintain ingress and egress at all times.
- D. Use water to minimize dust. Provide hoses and water connections for this purpose.
- E. Comply with governing regulations pertaining to environmental protection.
- F. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.
- G. Keep public streets free of mud, dirt, dust and other debris.

### 3.3 DEMOLITION

- A. Demolish site improvements designated to be removed as shown on the drawings. Site improvements shall include but not be limited to buildings, retaining walls, foundations, pavements, curbs and gutters, drainage structures, utilities, signage or landscaping.
- B. Disconnect and cap or remove utilities to be abandoned as shown on the drawings.
- C. Fill or remove underground tanks, piping, and appurtenances as specified.
- D. Demolish buildings completely and remove from site using methods as required to complete work within limitations of governing regulations. Small buildings may be removed intact when acceptable to Owner and authorities having jurisdiction.
- E. Locate demolition equipment and remove materials to prevent excessive loading to supporting walls, floors, or framing.
- F. Demolish and remove any concrete and masonry slabs or foundation visible on the surface or identified on the drawing to be removed.

### 3.4 FILLING BASEMENTS AND VOIDS

- A. Unless otherwise directed, completely fill below grade areas and voids resulting from demolition or removal of buildings, foundations, utility structures, underground fuel storage tanks, wells, cisterns, etc., using materials and methods specified in section 31 20 00 Earthwork.



- B. Areas to be filled shall be free of standing water, frost, frozen or unsuitable material, trash, and debris prior to fill placement.
- C. Place fill materials in accordance with Section 31 20 00 Earthwork unless subsequent excavation for new work is required.
- D. Grade surface to match adjacent grades and to provide adequate and correctly routed flow of surface drainage after fill placement and compaction.

### 3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from site debris, rubbish, and other materials resulting from demolition operations. Leave areas of work in clean condition.
- B. No burning of any material, debris, or trash on-site or off-site will be allowed except when allowed by appropriate governing authority and Owner. If allowed as stated above, burning shall be performed in manner prescribed by governing authority. Attend burning materials until fires have burned out and have been completely extinguished.
- C. Transport materials removed from demolished items with appropriate vehicles and dispose off-site to areas that are approved for disposal by governing authorities and appropriate property owners.

**END OF SECTION 02 41 00**

## SECTION 024116 - STRUCTURE DEMOLITION

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Demolition and removal of buildings.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and removing site utilities.

##### B. Related Requirements:

1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

#### 1.2 DEFINITIONS

- ##### A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

#### 1.3 MATERIALS OWNERSHIP

- ##### A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- ##### B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

#### 1.4 PREINSTALLATION MEETINGS

##### A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
  - 1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain, including means of egress from those buildings.
- C. Schedule of Building Demolition Activities: Indicate the following:
  - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
  - 2. Temporary interruption of utility services.
  - 3. Shutoff and capping or re-routing of utility services.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before the Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

## 1.6 QUALITY ASSURANCE

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

## 1.7 FIELD CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area may be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
  - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
  - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
    - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before building demolition, Owner will remove the following items:

- a. All overhead doors and associated lifts and hardware.
- b. Condensing unit and A-coil
- c. All technology and security equipment and devices

D. Hazardous Materials: Hazardous materials are present in the building(s) and structure(s) to be demolished. Refer to Specification Section 00 31 26 for the Hazardous Materials Report. Examine report to become aware of locations where hazardous materials are present.

1. Contractor shall be responsible for any and all abatement of hazardous materials at all locations included in the demolition scope in accordance with regulatory requirements.

E. On-site storage or sale of removed items or materials is not permitted.

## 1.8 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

### 2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earthwork."

## PART 3 - EXECUTION

### 3.1 DEMOLITION CONTRACTOR

A. Demolition Contractor:

1. Demolition Contractor Qualifications: An experienced firm that has specialized in demolition work similar in material and scope to that indicated for this project.

### 3.2 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

- B. Review Project Documents of existing construction or other existing condition and hazardous material information provided. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

### 3.3 PREPARATION

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

### 3.4 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Utilities to Be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
  - 1. Arrange to shut off utilities with utility companies.
  - 2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
  - 3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
  - 4. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

### 3.5 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of demolition.
- C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.
  - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

- D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
1. Protect adjacent buildings and facilities from damage due to demolition activities.
  2. Protect existing site improvements, appurtenances, and landscaping to remain.
  3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
  4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
  6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
  7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

### 3.6 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
  2. Maintain fire watch during and for at least 4 hours after flame-cutting operations.
  3. Maintain adequate ventilation when using cutting torches.
  4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
  2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

### 3.7 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  - 1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
  - 1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- D. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

### 3.8 SITE RESTORATION

- A. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

### 3.9 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

### 3.10 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

### 3.11 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
  - 1. Clean roadways of debris caused by debris transport.

ODOT - EATON OUTPOST  
DOT-200023

Jerome M. Scott Architects, Inc.

END OF SECTION 024116





## SECTION 031000 – CONCRETE FORMING AND ACCESSORIES

### 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. Form-facing material for cast-in-place concrete.
- 2. Form liners.
- 3. Bracing and anchoring.

- B. Related Requirements:

- 1. Section 321313 "Concrete Paving" for formwork related to concrete pavement and walks.

#### 1.3 DEFINITIONS

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review the following:

- a. Special inspection and testing and inspecting agency procedures for field quality control.
- b. Construction, movement, contraction, and isolation joints
- c. Forms and form-removal limitations.
- d. Anchor rod and anchorage device installation tolerances.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Form liners.
4. Form ties.
5. Waterstops.
6. Form-release agent.

B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301 (ACI 301M).
  - a. Location of construction joints is subject to approval of the Architect.
3. Indicate location of waterstops.
4. Indicate form liner layout and form line termination details.
5. Indicate proposed schedule and sequence of stripping of forms.

C. Samples:

1. For waterstops.
2. For Form Liners: 12-inch by 12-inch (305-mm by 305-mm) sample, indicating texture.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Minutes of preinstallation conference.

## 1.7 QUALITY ASSURANCE

- A. Mockups: Formed surfaces to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
1. Build panel approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Architect.
  2. Subject to compliance with requirements, approved mockups may become part of the completed Work.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Form Liners: Store form liners under cover to protect from sunlight.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
  2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

### 2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
1. Provide continuous, true, and smooth concrete surfaces.
  2. Furnish in largest practicable sizes to minimize number of joints.
  3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
    - a. Plywood, metal, or other approved panel materials.
    - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      - 1) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
- B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
1. Provide lumber dressed on at least two edges and one side for tight fit.

~~C. Form Liners:~~

- ~~1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - ~~a. Sika Corporation~~
  - ~~b. SpecFormliners, Inc.~~
  - ~~c. Scott System~~
  - ~~d. Fitzgerald Formliners~~~~
- ~~2. Size: Minimum 8' wide x 4' high~~
- ~~3.2. Face Pattern: Stone~~

## 2.3 WATERSTOPS

- A. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals, with factory fabricate corners, intersections, and directional changes.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. JP Specialties, Inc.
    - b. Sika Corporation.
    - c. BoMetals, Inc.
    - d. Durajoint Concrete Accessories
  2. Profile: Ribbed with center bulb.
  3. Dimensions: 4 inches by 3/16 inch thick; nontapered or retrofit L with 3" legs minimum 3/16" thick set in epoxy gel at new construction between vertical walls and horizontal slabs.

## 2.4 RELATED MATERIALS

- A. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- C. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
  2. Form release agent for form liners shall be acceptable to form liner manufacturer.
- E. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
  2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
  3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301 (ACI 301M).
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M) and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
  - 1. Surface Finish-1.0: ACI 117 Class D, 1 inch (25 mm).
  - 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch (6 mm).
  - 3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch (3.0 mm).
- D. Construct forms tight enough to prevent loss of concrete mortar.
  - 1. Minimize joints.
  - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
  - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
  - 2. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
  - 1. Provide and secure units to support screed strips
  - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
  - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
  - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches (305 mm).
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Space vertical joints in walls as indicated on Drawings.
  - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
4. Clean embedded items immediately prior to concrete placement.

### 3.3 INSTALLATION OF WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.
  - 1. Install in longest lengths practicable.
  - 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
  - 3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 033000 "Cast-In-Place Concrete."
  - 4. Secure waterstops in correct position at 12 inches (305 mm) on center.
  - 5. Clean waterstops immediately prior to placement of concrete.
  - 6. Support and protect exposed waterstops during progress of the Work.

### 3.4 REMOVING AND REUSING FORMS

- A. Formwork for sides of walls and similar parts of the Work that do not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
- B. Clean and repair surfaces of forms to be reused in the Work.
  - 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
  - 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
  - 1. Align and secure joints to avoid offsets.
  - 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Architect will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
  - 1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000





## SECTION 032000 - CONCRETE REINFORCING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Steel reinforcement bars.
- 2. Welded-wire reinforcement.

- B. Related Requirements:

- 1. Section 321313 "Concrete Paving" for reinforcing related to concrete pavement and walks.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review the following:

- a. Special inspection and testing and inspecting agency procedures for field quality control.
- b. Construction contraction and isolation joints.
- c. Steel-reinforcement installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Each type of steel reinforcement.
- 2. Epoxy repair coating.
- 3. Bar supports.

- B. Shop Drawings: Comply with ACI SP-066:

- 1. Include placing drawings that detail fabrication, bending, and placement.
- 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
  - 1. Location of construction joints is subject to approval of the Architect.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
- B. Minutes of preinstallation conference.

#### 1.6 QUALITY ASSURANCE

- A. Mockups: Reinforcing for cast-concrete formed surfaces, to demonstrate tolerances and standard of workmanship.
  - 1. Build panel approximately 100 sq. ft. for formed surface in the location indicated on Drawings or, if not indicated, as directed by Architect.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage and to avoid damaging coatings on steel reinforcement.
  - 1. Store reinforcement to avoid contact with earth.
  - 2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.

### PART 2 - PRODUCTS

#### 2.1 STEEL REINFORCEMENT

- A. Epoxy-Coated Reinforcing Bars:
  - 1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
  - 2. Epoxy Coating: ASTM A77 or ASTM A934 with less than 2 percent damaged coating in each 12-inch bar length.
- B. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, plain steel.

## 2.2 REINFORCEMENT ACCESSORIES

- A. Epoxy-Coated Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420), plain-steel bars, ASTM A775/A775M epoxy coated.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
  - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
    - a. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
- C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch (1.2908 mm) in diameter.
  - 1. Finish: ASTM A884/A884M, Class A, Type 1, epoxy coated, with less than 2 percent damaged coating in each 12-inch wire length.
- D. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A775/A775M.

## 2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection of In-Place Conditions:
  - 1. Do not cut or puncture vapor retarder.
  - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of earth, ice, and other foreign materials that reduce bond to concrete.

### 3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
  - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
  - 2. Do not tack weld crossing reinforcing bars.

- C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
  - 1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches (610 mm), whichever is greater.
  - 2. Stagger splices in accordance with ACI 318 (ACI 318M).
- G. Install welded-wire reinforcement in longest practicable lengths.
  - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
    - a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches (305 mm).
  - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches
  - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
  - 4. Lace overlaps with wire.
- H. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.

### 3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement.
  - 2. Continue reinforcement across construction joints unless otherwise indicated.
  - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

### 3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117 (ACI 117M).

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel-reinforcement placement.

END OF SECTION 032000



## SECTION 033000 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
  - 1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
  - 2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
  - 3. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
  - 4. Section 321313 "Concrete Paving" for concrete pavement and walks.

#### 1.3 DEFINITIONS

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

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete Subcontractor.
  - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures,



curing procedures, construction contraction and isolation joints, vapor-retarder installation, anchor rod and anchorage device installation tolerances, methods for achieving specified floor and slab flatness and levelness, floor and slab flatness and levelness measurement, and concrete protection.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
  - 1. Location of construction joints is subject to approval of the Architect.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Color pigments.
  - 4. Curing compounds.
  - 5. Floor and slab treatments.
  - 6. Bonding agents.
  - 7. Adhesives.
  - 8. Vapor retarders.
  - 9. Semirigid joint filler.
  - 10. Joint-filler strips.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. 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.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

- C. Mockups: Cast concrete formed-surface panel to demonstrate surface finish, texture, color, and standard of workmanship of exterior wainscot wall.
  - 1. Formed Surfaces: Build panel approximately 20 sq. ft. in the location indicated or, if not indicated, as directed by Architect.

## 1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
  - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301 (ACI 301M).
  - 2. ACI 117 (ACI 117M).

### 2.2 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I Type II Type I/II.
  2. Fly Ash: ASTM C 618, Class F or C.
  3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
  2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Lightweight Aggregate: ASTM C330/C330M, 1-inch nominal maximum aggregate size.
- E. Air-Entraining Admixture: ASTM C 260/C 260M.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM 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.
- ~~G. Color Pigment: ASTM C979/C979M, synthetic mineral oxide pigments, color stable, nonfading, and resistant to lime and other alkalis.~~
- ~~1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - ~~a. BASF Corporation~~
    - ~~b. Euclid Chemical~~
    - ~~c. Solomon Colors~~~~
  - ~~2. Color: As selected by Architect from manufacturer's full range.~~
- ~~H.G. Water: ASTM C 94/C 94M and potable.~~

## 2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive joint tape, not less than 10 mils (0.25 mm) thick.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Insulation Solutions, Inc.
    - b. Raven Industries, Inc.
    - c. Stego Industries, LLC.

2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. BASF Corp. - Construction Chemicals.
  - b. ChemMasters, Inc.
  - c. Dayton Superior.
  - d. Euclid Chemical Company (The); an RPM company.
  - e. Kaufman Products, Inc.
  - f. L&M Construction Chemicals, Inc.
  - g. SpecChem, LLC.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- 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, dissipating. Compound to be approved by epoxy flooring manufacturer at Admin slab-on-grade.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. BASF Corp. - Construction Chemicals.
  - b. ChemMasters, Inc.
  - c. Euclid Chemical Company (The); an RPM company.
  - d. L&M Construction Chemicals, Inc.
  - e. W.R. Meadows, Inc.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. ChemMasters, Inc.
  - b. Euclid Chemical Company (The); an RPM company.
  - c. Kaufman Products, Inc.
  - d. L&M Construction Chemicals, Inc.
  - e. W.R. Meadows, Inc.

## 2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

## 2.6 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
  - 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

## 2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash: 25 percent.
  - 2. Combined Fly Ash and Pozzolan: 25 percent.
  - 3. Slag Cement: 50 percent.
  - 4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- C. Limit permeability of concrete to maximum 2,000 coulombs. Determine the permeability by testing according to AASHTO T277 except moist cure the permeability samples for 7 days at 7 F followed by 21 days moist curing at 100 F. Perform permeability testing at 28 days.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete for placement and workability.
  - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Adjust the absolute volume of the aggregate if the cement content is increased. The Owner will not provide additional compensation for the admixture or additional cement required by this adjustment.
  - 4. Use an approved set-retarding admixture, Type B or D when the concrete temperature exceeds a nominal temperature of 75 degrees F.

If during the work, the specific gravity of an aggregate changes more than +/-0.02, adjust the design weight to conform to the new specific gravity. Make unit weight determinations in order to calculate and maintain the yield according to ASTM C138. Based on these determinations, adjust the batch weights when necessary. Maintain the specified cement content within a tolerance of +/-1 percent and do not exceed the maximum water-cement ratio. Adjust the amount of water added at the mixer based on the moisture contained in the aggregate and the moisture that the aggregates will absorb.

- F. Color Pigment: Add color pigment to concrete mixture in accordance with manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

## 2.8 CONCRETE MIXTURES FOR BUILDING ELEMENTS

### A. Footings and Curbs: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
3. Slump Limit: 2 - 4 inches nominal; 5 inch maximum.

### B. Walls and Piers: **Medium-weight concrete.**

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Calculated Equilibrium Unit Weight: Less than 125 lb/cu. ft. as determined by ASTM C567/C567M.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd.
4. Slump Limit: 2 - 4 inches nominal; 5 inch maximum.
5. Air Content: 6 percent, plus or minus 2 percent at point of delivery.

### C. Truck Storage and Admin Interior Slab-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd.
4. Slump Limit: 2 - 4 inches nominal; 5 inch maximum.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

### D. Aprons and Stoops: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd.
4. Slump Limit: 2 - 4 inches nominal; 5 inch maximum.
5. Air Content: 6 percent, plus or minus 2 percent at point of delivery.

## 2.9 CONCRETE MIXING

### A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
  2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

### 3.2 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

### 3.3 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  2. Form keyed joints as indicated in Drawings. Embed keys at least 1-1/2 inches (38 mm) into concrete.
  3. Space vertical joints in walls as indicated in Drawings. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete



when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as columns, piers, bollards, foundation walls, interior and exterior catch basins/trenches, and other locations, as indicated in Drawings.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
  - 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
  - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Notify Architect and testing and inspection agencies 24 hours (48 hours for slab pours) prior to commencement of concrete placement. Slab reinforcing shall be set in place 48 hours prior to commencement of concrete placement for observation by the Engineer.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.\
- E. Maintain slump within the nominal slump range in Paragraph 2.12. If below the maximum water-cement ratio, then adjust the quantity of water to meet slump requirements. Do not use concrete with a slump greater than the maximum shown in Paragraph 2.12. When the slump exceeds the nominal slump limit but is below the maximum limit, the Contractor may use an occasional load of concrete in this condition, provided the mixture of succeeding loads is immediately adjusted to reduce slump to within the nominal range.
- F. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated in Drawings. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
  3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- G. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

### 3.5 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. 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 defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.
- 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.

### 3.6 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of

trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated in Drawings.
  2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 20; and of levelness, F(L) 17; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
    - b. Correct the slab surface if actual F(F) or F(L) number for the floor installation measures less than required.
- C. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated in Drawings. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated in Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.7 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
  2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
  3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
  4. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  5. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

### 3.8 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 ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) 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 (300 mm), 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.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
  - 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.
  - 4. Curing and Sealing Compound: Apply uniformly (only to areas of ADMIN slab-on-grade to remain exposed with no epoxy flooring) in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.9 LIQUID FLOOR TREATMENT APPLICATION

- A. Temporary Lighting: Minimum 200 W light source, placed 8 feet above the floor surface, for each 425 sq. ft. of floor being finished.
- B. Temporary Heat: Ambient temperature of 50 degrees F minimum.
- C. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.
- D. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.
- E. Correct defects in the defined traffic floor by grinding or removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

### 3.10 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching

- mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.12 FIELD QUALITY CONTROL

- A. Special Inspections: The Architect will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
  - 1. Headed bolts and studs.
  - 2. Verification of use of required design mixture.
  - 3. Concrete placement, including conveying and depositing.
  - 4. Curing procedures and maintenance of curing temperature.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
  - 5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
    - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 6. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  - 7. Additional Tests: Testing and inspecting agency shall make additional tests of concrete, at Contractor's expense, when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
  - 8. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

## SECTION 033010 - CAST-IN-PLACE SILICA FUME CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
  - 1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
  - 2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
  - 3. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
  - 4. Section 321313 "Concrete Paving" for concrete pavement and walks.

#### 1.3 DEFINITIONS

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

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete Subcontractor.
  - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures,



curing procedures, construction contraction and isolation joints, vapor-retarder installation, anchor rod and anchorage device installation tolerances, methods for achieving specified floor and slab flatness and levelness, floor and slab flatness and levelness measurement, and concrete protection.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
  - 1. Location of construction joints is subject to approval of the Architect.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Curing compounds.
  - 4. Floor and slab treatments.
  - 5. Bonding agents.
  - 6. Adhesives.
  - 7. Vapor retarders.
  - 8. Semirigid joint filler.
  - 9. Joint-filler strips.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. 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.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

## 1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
  - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301 (ACI 301M).
  - 2. ACI 117 (ACI 117M).

### 2.2 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
  - 1. Portland Cement: ASTM C 150/C 150M, Type I Type II Type I/II.
  - 2. Fly Ash: ASTM C 618, Class F or C.
  - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
  - 4. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM 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.

F. Water: ASTM C 94/C 94M and potable.

### 2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive joint tape, not less than 10 mils (0.25 mm) thick.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Insulation Solutions, Inc.
  - b. Raven Industries, Inc.
  - c. Stego Industries, LLC.

### 2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. BASF Corp. - Construction Chemicals.
  - b. ChemMasters, Inc.
  - c. Dayton Superior.
  - d. Euclid Chemical Company (The); an RPM company.
  - e. Kaufman Products, Inc.
  - f. L&M Construction Chemicals, Inc.
  - g. SpecChem, LLC.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

- 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, dissipating.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corp. - Construction Chemicals.
    - b. ChemMasters, Inc.
    - c. Euclid Chemical Company (The); an RPM company.
    - d. L&M Construction Chemicals, Inc.
    - e. W.R. Meadows, Inc.

## 2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

## 2.6 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
  4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

## 2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
  2. Combined Fly Ash and Pozzolan: 25 percent.
  3. Slag Cement: 50 percent.
  4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
  5. Silica Fume: 10 percent.
  6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
  7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit permeability of concrete to maximum 2,000 coulombs. Determine the permeability by testing according to AASHTO T277 except moist cure the permeability samples for 7 days at 7 F followed by 21 days moist curing at 100 F. Perform permeability testing at 28 days.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Adjust the absolute volume of the aggregate if the cement content is increased. The Owner will not provide additional compensation for the admixture or additional cement required by this adjustment.
4. Use an approved set-retarding admixture, Type B or D when the concrete temperature exceeds a nominal temperature of 75 degrees F.

If during the work, the specific gravity of an aggregate changes more than  $\pm 0.02$ , adjust the design weight to conform to the new specific gravity. Make unit weight determinations in order to calculate and maintain the yield according to ASTM C138. Based on these determinations, adjust the batch weights when necessary. Maintain the specified cement content within a tolerance of  $\pm 1$  percent and do not exceed the maximum water-cement ratio. Adjust the amount of water added at the mixer based on the moisture contained in the aggregate and the moisture that the aggregates will absorb.

## 2.8 CONCRETE MIXTURES FOR BUILDING ELEMENTS

### A. Wash Bay Slab-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd.
4. Slump Limit: 2 - 4 inches nominal; 5 inch maximum; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
5. Air Content (at Brine Storage only): 6 percent, plus or minus 2 percent at point of delivery.
6. Air Content: Do not allow air content of trowel-finished floors (at Wash Bay only) to exceed 3 percent.

## 2.9 CONCRETE MIXING

### A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

### PART 3 - EXECUTION

#### 3.1 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
  2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
  3. Install dovetail anchor slots in concrete structures as indicated in Drawings.

#### 3.2 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

#### 3.3 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
  3. Space vertical joints in walls as indicated in Drawings. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete

when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as columns, piers, bollards, foundation walls, interior and exterior catch basins/trenches, and other locations, as indicated in Drawings.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
  - 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
  - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Notify Architect and testing and inspection agencies 24 hours (48 hours for slab pours) prior to commencement of concrete placement. Slab reinforcing shall be set in place 48 hours prior to commencement of concrete placement for observation by the Engineer.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.\
- E. Maintain slump within the nominal slump range in Paragraph 2.12. If below the maximum water-cement ratio, then adjust the quantity of water to meet slump requirements. Do not use concrete with a slump greater than the maximum shown in Paragraph 2.12. When the slump exceeds the nominal slump limit but is below the maximum limit, the Contractor may use an occasional load of concrete in this condition, provided the mixture of succeeding loads is immediately adjusted to reduce slump to within the nominal range.
- F. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated in Drawings. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.



2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
  3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- G. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

### 3.5 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. 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 defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.
- 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.

### 3.6 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots.

Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated in Drawings to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated in Drawings.
  2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 20; and of levelness, F(L) 17; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
    - b. Correct the slab surface if actual F(F) or F(L) number for the floor installation measures less than required.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated in Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.7 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
  2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.

3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
4. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

### 3.8 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 ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) 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 (300 mm), 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.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

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.
  - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.9 LIQUID FLOOR TREATMENT APPLICATION

- A. Temporary Lighting: Minimum 200 W light source, placed 8 feet above the floor surface, for each 425 sq. ft. of floor being finished.
- B. Temporary Heat: Ambient temperature of 50 degrees F minimum.
- C. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.
- D. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.
- E. Correct defects in the defined traffic floor by grinding or removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

### 3.10 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 2. After concrete has cured at least 14 days, correct high areas by grinding.
  - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  - 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.12 FIELD QUALITY CONTROL

- A. Special Inspections: The Architect will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
  1. Headed bolts and studs.
  2. Verification of use of required design mixture.
  3. Concrete placement, including conveying and depositing.
  4. Curing procedures and maintenance of curing temperature.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
  1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
  5. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  6. Additional Tests: Testing and inspecting agency shall make additional tests of concrete, at Contractor's expense, when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

7. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033010

## SECTION 055000 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Shelf angles.
4. Miscellaneous steel trim including steel edgings and edge angles.
5. Metal bollards.
6. Loose bearing and leveling plates for applications where they are not specified in other Sections.

- B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

- C. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" and "Cast-in-Place Silica Fume Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Division 09 Section "High Performance Coatings" for painting misc. metal fabrications

#### 1.3 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.



#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Paint products.
  - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
  - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

#### 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, "Structural Welding Code - Stainless Steel."

#### 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

#### 1.8 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of anchorages. 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.

## PART 2 - PRODUCTS

### 2.1 METALS, GENERAL

- 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.

### 2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. 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.
- C. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

### 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide 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.
- 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. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Eyebolts: ASTM A 489.

- E. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- F. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).
- G. Wood Screws: Flat head, ASME B18.6.1.
- H. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- I. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- J. 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, conducted by a qualified independent testing agency.
- K. 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, all hot-dip galvanized per ASTM F 2329.
- L. Post-Installed Anchors: Torque-controlled expansion 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.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
  - 1. Products:
    - a. Sure Grip High Performance Grout; Dayton Superior Corp.
    - b. Euco N-S Grout; Euclid Chemical Company
    - c. Masterflow 928 and 713; Master Builders Technologies Inc.
- H. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 4000 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 will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications 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.
  1. 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 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. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports in the following locations:
  1. Exterior Locations
  2. Overhead door sills
  3. Interior Locations where indicated in drawings.

## 2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
  1. Provide mitered and welded units at corners.
  2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

## 2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim.

## 2.9 METAL BOLLARDS

- A. Fabricate metal bollards from 6" diameter Schedule 40 steel pipe. Fill bollards with concrete.
- B. Galvanized finish.
- C. Provide HDPE slip covers for all bollards.
  - 1. Subject to compliance, provide products by one of the following:
    - a. Post Guard
    - b. Ideal Shield
    - c. Innoplast
  - 2. Color to be selected by A/E from manufacturer's standard colors.

## 2.10 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 located in exterior conditions.

## 2.11 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches (200 mm) unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

## 2.12 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

## 2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated in the drawings and specifications 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. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with universal shop primer
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- D. 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.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
  - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

### 3.3 INSTALLING METAL BOLLARDS

- A. Fill bollards solidly with concrete, mounding top surface to shed water. Provide run out hole at bottom of bollard.
  - 1. Do not fill removable bollards with concrete.



- B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

#### 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. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division OM 09 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

## SECTION 061000 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking, cants, and nailers.
4. Wood furring.
5. Plywood backing panels.

- B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.
2. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.

#### 1.3 DEFINITIONS

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates Upon Request: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports Upon Request: For the following, from ICC-ES:
  1. Wood-preservative-treated wood.
  2. Engineered wood products.
  3. Power-driven fasteners.
  4. Post-installed anchors.
  5. Metal framing anchors.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

## PART 2 - PRODUCTS

### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
- B. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal thickness unless otherwise indicated.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  - 1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  - 2. Wood sills, blocking, and similar concealed members in contact with masonry or concrete.
  - 3. Wood floor plates that are installed over concrete slabs-on-grade.
  - 4.

### 2.3 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.
  - 1. Application: Interior partitions not indicated as load bearing.

2. Species:
  - a. Hem-fir (north); NLGA.
  - b. Southern pine or mixed southern pine; SPIB.
  - c. Spruce-pine-fir; NLGA.
  - d. Hem-fir; WCLIB, or WWPA.
  - e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
  - f. Eastern softwoods; NeLMA.

B. Load-Bearing Partitions and Shear Walls: No. 2 grade.

1. Application: Exterior walls and interior shear walls.
2. Species:
  - a. Hem-fir (north); NLGA.
  - b. Southern pine or mixed southern pine; SPIB.
  - c. Spruce-pine-fir; NLGA.
  - d. Hem-fir; WCLIB or WWPA.
  - e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Joists, Rafters, and Other Framing Not Listed Above: No. 2 grade.

1. Species:
  - a. Hem-fir (north); NLGA.
  - b. Southern pine or mixed southern pine; SPIB.
  - c. Spruce-pine-fir; NLGA.
  - d. Hem-fir; WCLIB or WWPA.
  - e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

## 2.4 ENGINEERED WOOD PRODUCTS

- A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.
- B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.
  1. Extreme Fiber Stress in Bending, Edgewise: 2600 psi for 12-inch nominal- depth members.
  2. Modulus of Elasticity, Edgewise: 1,900,000 psi .

## 2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  1. Blocking.
  2. Nailers.
  3. Furring.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Eastern softwoods; NeLMA.

- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

## 2.7 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on [ICC-ES AC01] [ICC-ES AC58] [ICC-ES AC193] [or] [ICC-ES AC308] as appropriate for the substrate.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.

## 2.8 METAL FRAMING ANCHORS

- A. Manufacturer of products shall be one of the following or an approved equal:
1. Simpson Strong-Tie (Basis of Design).
  2. USP by Mi-tek, Inc.
  3. Tamlyn
- B. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational

engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- D. Joist Hangers: U-shaped joist hangers with 2-inch-long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.
- E. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
- F. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.
- G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.
- H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
- I. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.
- J. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick by 36 inches (914 mm) long.
- K. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.

## 2.9 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- G. Do not splice structural members between supports unless otherwise indicated.
- H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
  - 1. Fire block furred spaces of walls, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
  - 2. Fire block concealed spaces of wood-framed walls and partitions at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
  - 3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.
- J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- K. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.

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

### 3.2 WOOD BLOCKING, AND NAILER INSTALLATION

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

### 3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

### 3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.
  - 1. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
  - 1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
  - 2. For load-bearing walls, provide jamb studs as indicated in Drawings.

### 3.5 RAFTER FRAMING INSTALLATION

- A. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers.



3.6 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

## SECTION 061600 - SHEATHING

### 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. Wall sheathing.
- 2. Roof sheathing.
- 3. Sheathing joint and penetration treatment.

- B. Related Requirements:

- 1. Section 061000 "Rough Carpentry" plywood backing panels.
- 2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports upon request: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.
- B. Evaluation Reports upon request: For the following, from ICC-ES:
  - 1. Air-barrier and water-resistant glass-mat gypsum sheathing.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Thickness: Not less than thickness indicated.
- B. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

- A. Plywood Sheathing: DOC PS 1, Exposure 1 sheathing.
  - 1. Span Rating: Not less than 40/20.
  - 2. Nominal Thickness: Not less than 19/32 inch.
  - 3. Location: Specified shear walls only in accordance with shear wall schedule in structural drawings.
- B. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation
    - b. Georgia Pacific LLC
    - c. National Gypsum Company
    - d. USG Corporation
  - 2. Type and Thickness: Type X, 5/8 inch thick.
  - 3. Size: 48 by 96 inches for vertical installation.
  - 4. Location: All exterior wall sheathing with exception of shear walls specifically noted to receive plywood sheathing in structural drawings.

2.3 ROOF SHEATHING

- A. Plywood Sheathing: DOC PS 1, Exposure 1 sheathing.
  - 1. Span Rating: Not less than 40/20.
  - 2. Nominal Thickness: Not less than 19/32 inch.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

## 2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
  1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
  2. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

### 3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Wall and Roof Sheathing:
    - a. Nail to wood framing.
    - b. Space panels 1/8 inch (3 mm) apart at edges and ends.

### 3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
  - 1. Fasten gypsum sheathing to wood framing with screws.
  - 2. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
  - 3. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
  - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
- D. Seal sheathing joints according to sheathing manufacturer's written instructions.
  - 1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

## SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

### 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. Wood roof trusses.
  - 2. Wood girder trusses.

#### 1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

#### 1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for trusses.
  - 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
  - 2. Indicate sizes, stress grades, and species of lumber.
  - 3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
  - 4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
  - 5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
  - 6. Show splice details and bearing details.
- B. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
  2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
  3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
1. Design Loads: As indicated.
  2. Maximum Deflection under Design Loads: As indicated.
- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

## 2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
  - 3. Provide dressed lumber, S4S.
  - 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
  
- B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

## 2.3 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1.
  
- B. Hot-Dip Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch thick.

## 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
  
- B. Nails, Brads, and Staples: ASTM F1667.

## 2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Allowable design loads, as published by manufacturer, shall comply with or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
  
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
  
- C. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, size as indicated on Drawings.



- D. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick. Clip is fastened to truss through slotted holes to allow for truss deflection.
- E. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches (38 mm) wide by 1 inch (25 mm) deep by 0.040 inch (1.0 mm) thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

## 2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 92 percent zinc dust by weight.

## 2.7 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
  - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

- G. Anchor trusses securely at bearing points; use metal truss tie-downs or roof truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
  - 1. Install bracing to comply with Section 061000 "Rough Carpentry.
  - 2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- L. Replace wood trusses that are damaged or do not comply with requirements.
  - 1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

### 3.2 REPAIRS AND PROTECTION

- A. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Repair damaged galvanized coatings on exposed surfaces according to ASTM A780/A780M and manufacturer's written instructions.

### 3.3 FIELD QUALITY CONTROL

- A. Inspections: Owner will engage a qualified inspector to perform inspections to verify that temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

END OF SECTION 061753



## SECTION 064116- ARCHITECTURAL CASEWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Plastic-laminate cabinets.
  - 2. Solid surface countertops.
  - 3. Solid surface window stools.
  - 4. Grommets.
- B. Related Sections include the following:
  - 1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

#### 1.2 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, including plywood, solid-surfacing material, high-pressure decorative laminate, adhesive for bonding plastic laminate, cabinet hardware and accessories.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Show details full size.
  - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  - 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, grommets, and other items installed in architectural casework.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
  - 1. Plastic laminates.
  - 2. Solid-surfacing materials.

3. Cabinet hardware and accessories
- D. Samples for Verification: For the following:
1. Solid-surfacing materials, 6 inches square.
  2. Plastic-laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
  3. Exposed cabinet hardware and accessories, one unit for each type and finish.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

#### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing architectural casework similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Casework Quality Standards" for grades of interior architectural casework, construction, finishes, and other requirements.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until framing and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where casework is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed and indicate measurements on Shop Drawings.
  - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating casework without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural casework can be supported and installed as indicated in the drawings.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of casework and quality grade specified, unless otherwise indicated. All cabinet boxes, drawers and doors to be constructed using plywood construction.
- B. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a pre-coated finish.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Corian; DuPont Polymers.
    - b. Formica Solid Surface; Formica Corporation.
    - c. Wilsonart International
  - 2. Colors and Patterns:
    - a. As selected by Architect from manufacturer's full range. Basis of design:
      - 1) Corian "Silver Birch"

- C. High-Pressure Decorative Laminate: NEMA LD 3, grade HGS.
  - 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
    - a. Wilsonart International; Div. of Premark International, Inc.
    - b. Nevamar Decorative Surfaces.
    - c. Formica Corporation
  - 2. Colors and Patterns:
    - a. As selected by Architect from manufacturer's full range. Basis of design:
      - 1) Wilsonart "Harvest Maple" (Vertical Casework)
- D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

## 2.2 HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- D. Wire Pulls: Back mounted, 4 inches (100 mm) long, 5/16 inches (8 mm) in diameter.
- E. Shelf Rests: BHMA A156.9, B04013.
- F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
  - 1. Box Drawer Slides: 100 lbf (440 N).
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
  - 2. Satin Stainless Steel: BHMA 630.
- J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

- K. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
  - 1. Provide Grommets 4'-0" o.c. (refer to drawings for locations).

## 2.3 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as directed for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Miscellaneous metal brackets and supports: Fabricated steel brackets and supports made from tube steel, metal plate and angles to support cabinets and counters.

## 2.4 FABRICATION, GENERAL

- A. Include necessary steel structure in cabinets and counters to accommodate the needs of the unit.
- B. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify A/E seven days in advance of the dates and times cabinet fabrication will be complete.
  - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

## 2.5 SOLID-SURFACING-MATERIAL COUNTER TOPS AND WINDOW STOOLS

- A. Quality Standard: Comply with AWI Section 400 Custom Grade requirements for countertops.
- B. Solid-Surfacing-Material Thickness: 1/2 inch.

## 2.6 PLASTIC-LAMINATE CABINETS

- A. Quality Standard: Comply with AWI Section 400 Custom Grade requirements for laminate cabinets.



- B. AWI Type of Cabinet Construction: Flush overlay
- C. Base construction material: Plywood with laminate finish on exposed and semi-exposed surfaces.
- D. Reveal Dimension: 1/8 inches.
- E. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
  - 1. Grade: Custom
  - 2. Horizontal Surfaces Other Than Tops: HGS.
  - 3. Postformed Surfaces: HGP.
  - 4. Vertical Surfaces: HGS.
  - 5. Edges: PVC tape, 0.018-inch (0.460-mm) minimum thickness, matching laminate in color, pattern, and finish.
- F. Materials for Semi-exposed Surfaces: Provide surface materials indicated below:
  - 1. Surfaces Other Than Drawer Bodies: Plywood with white laminate finish.
  - 2. Drawer Sides and Backs: Plywood with white laminate finish.
  - 3. Drawer Bottoms: Plywood with white laminate finish.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Condition casework to average prevailing humidity conditions in installation areas before installation.
- B. Before installing architectural casework, examine shop-fabricated work for completion and complete work, including removal of packing and back-priming.

### 3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Shim with concealed shims to complete installation within these tolerances.
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as specified herein.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
  - 1. Fabricate counter tops in one piece with shop-applied edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
  - 2. When Seams are required align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  - 3. Install all countertops and sills with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 4. Seal space between countertop and wall with sealant; color, to match solid surface material, strike bead flush with sill.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064116



## SECTION 072100 - THERMAL INSULATION

### 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. Extruded polystyrene foam-plastic board insulation.
- 2. Glass-fiber blanket insulation.

- B. Related Requirements:

- 1. Section 061600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
- 2. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Extruded polystyrene foam-plastic board insulation.
- 2. Glass-fiber blanket insulation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Research Reports: For foam-plastic insulation, from ICC-ES.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
  - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 - PRODUCTS

2.1 General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
2. Provide R values identified:
  - a. Under slab perimeter insulation minimum if R-10
  - b. Continuous Polystyrene Board Insulation at wall R-5
  - c. Foil Faced, Glass Fiber Blanket Insulation in wall cavity minimum of R-19
  - d. Foil Faced, Glass Fiber Blanket Insulation in attic cavity minimum of R-38

## 2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Extruded Polystyrene Board Insulation, Type IV: ASTM C578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. DiversiFoam Products.
  - b. Dow Chemical Company.
  - c. Owens Corning.
  - d. Dupont de Nemours, Inc.
2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.

## 2.3 GLASS-FIBER BLANKET INSULATION

A. Glass-Fiber Blanket Insulation, Foil Faced: ASTM C665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. CertainTeed Corporation
  - b. Johns Manville Corporation
  - c. Owens Corning.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation **12 inches (305 mm)** and wider in width.

#### 2.4 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
  1. Plate: Perforated, galvanized carbon-steel sheet, **0.030 inch (0.762 mm)** thick by **2 inches (50 mm)** square.
  2. Spindle: Copper-coated, low-carbon steel; fully annealed; **0.105 inch (2.67 mm)** in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from **0.016-inch- (0.41-mm-)** thick galvanized-steel sheet, with beveled edge for increased stiffness, sized to hold insulation securely in place, but not less than **1-1/2 inches (38 mm)** square or in diameter.
  1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
    - a. Attic spaces.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

#### 2.5 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
  1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
  2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum
- B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

#### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.

- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

### 3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

### 3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain **3-inch (76-mm)** clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
  - 5. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
    - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
  - 6. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

- a. Exterior Walls: Set units with facing placed toward interior of construction.
  - b. Interior Walls (Between Truck Storage and Wash Bay): Set units with facing placed toward Wash Bay.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
  2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

### 3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100





## SECTION 072500 - WEATHER BARRIERS

### 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. Building wrap.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: Show details of building wrap at terminations, openings, and penetrations. Show details of flexible flashing applications.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier, from ICC-ES.

### PART 2 - PRODUCTS

#### 2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E84; UV stabilized; and acceptable to authorities having jurisdiction.
  - 1. Dorken Systems Inc.
  - 2. Dow Chemical Company
  - 3. DuPont
  - 4. Raven Industries
  - 5. TYPAR
  - 6. Water-Vapor Permeance: Not less than 20 perms per ASTM E96/E96M, Desiccant Method (Procedure A).
  - 7. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg (0.02 L/s x sq. m at 75 Pa) when tested according to ASTM E2178.

8. Allowable UV Exposure Time: Not less than three months.
  9. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

### PART 3 - EXECUTION

#### 3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
  1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
  2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.
- C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
  1. Seal seams, edges, fasteners, and penetrations with tape.
  2. Extend into jambs of openings and seal corners with tape.

END OF SECTION 072500

*SECTION 073113 - ASPHALT SHINGLES (ALTERNATE 2)*

*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. Glass-fiber-reinforced asphalt shingles.*
  - 2. Underlayment materials.*
  - 3. Ridge vents.*
  - 4. Metal flashing and trim.*

*1.3 DEFINITIONS*

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

*1.4 ACTION SUBMITTALS*

- A. Product Data: For the following:*
- 1. Asphalt shingles.*
  - 2. Underlayment materials.*
  - 3. Ridge vents.*
  - 4. Asphalt roofing cement.*
  - 5. Elastomeric flashing sealant.*
- B. Shop Drawings: For metal flashing and trim.*
- C. Samples for Initial Selection:*
- 1. For each type of asphalt shingle indicated.*
  - 2. For each type of accessory involving color selection.*
- D. Samples for Verification: For the following products, in sizes indicated:*
- 1. Asphalt Shingles: Full size.*
  - 2. Ridge and Hip Cap Shingles: Full size.*
  - 3. Ridge Vent: 12-inch- (305-mm-) long Sample.*

1.5 *INFORMATIONAL SUBMITTALS*

- A. *Qualification Data: For Installer.*
- B. *Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by a qualified testing agency.*
- C. *Research Reports: For synthetic underlayment, from an agency acceptable to authorities having jurisdiction, indicating that product is suitable for intended use under applicable building codes.*
- D. *Sample Warranty: For manufacturer's materials warranty.*

1.6 *CLOSEOUT SUBMITTALS*

- A. *Maintenance Data: For asphalt shingles to include in maintenance manuals.*
- B. *Materials warranties.*
- C. *Roofing Installer's warranty.*

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. *Asphalt Shingles: 100 sq. ft. of each type and in each color and blend, in unbroken bundles.*

1.8 *DELIVERY, STORAGE, AND HANDLING*

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

1.9 *FIELD CONDITIONS*

- A. *Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.*

1. *Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.*

#### 1.10 *WARRANTY*

- A. *Materials Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.*

1. *Failures include, but are not limited to, the following:*

- a. *Manufacturing defects.*

2. *Materials Warranty Period: 40 years from date of Substantial Completion, prorated, with first five years nonprorated.*
3. *Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 110 mph for 15 years from date of Substantial Completion.*
4. *Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 10 years from date of Substantial Completion.*

- B. *Roofing Installer's Warranty: On warranty form, signed by Installer, in which Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.*

1. *Warranty Period: Two years from date of Substantial Completion.*

### *PART 2 - PRODUCTS*

#### 2.1 *SOURCE LIMITATIONS*

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

#### 2.2 *PERFORMANCE REQUIREMENTS*

- A. *Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.*
- B. *Wind Resistance: Provide asphalt shingles that comply with requirements of ASTM D3161/D3161M, Class F, and with ASTM D7158/D7158M, Class H.*

#### 2.3 *GLASS-FIBER-REINFORCED ASPHALT SHINGLES*

- A. *Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction; glass-fiber reinforced, mineral-granule surfaced, and self-sealing.*

1. *Manufacturers: Subject to compliance with requirements, provide products by one of the following:*
    - a. *CertainTeed*
    - b. *Owens Corning*
    - c. *GAF*
    - d. *Atlas*
  2. *Butt Edge: Straight cut.*
  3. *Strip Size: Manufacturer's standard*
  4. *Algae Resistance: Granules resist algae discoloration.*
  5. *Color and Blends: As selected by Architect from manufacturer's full range.*
- B. *Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.*

#### 2.4 UNDERLAYMENT MATERIALS

- A. *Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.*
1. *Manufacturers: Subject to compliance with requirements, provide products by one of the following:*
    - a. *CertainTeed*
    - b. *Owens Corning*
    - c. *GAF*
    - d. *Atlas*
- B. *Self-Adhering, Polymer-Modified Bitumen Sheet: ASTM D1970/D1970M, minimum 45-mil thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant top surface and release backing; cold applied.*
1. *Manufacturers: Subject to compliance with requirements, provide products by one of the following:*
    - a. *CertainTeed*
    - b. *Owens Corning*
    - c. *GAF*
    - d. *Atlas*

#### 2.5 RIDGE VENTS

- A. *Rigid Ridge Vent: Manufacturer's standard, rigid-section, high-density, UV-stabilized plastic ridge vent for use under ridge shingles.*
1. *Manufacturers: Subject to compliance with requirements, provide products by one of the following:*
    - a. *CertainTeed*
    - b. *Owens Corning*
    - c. *GAF*

- d. *Atlas*
2. *Minimum Net Free Area: 16 SF*
3. *Width: Min. 11"*
4. *Features:*
  - a. *Nonwoven geotextile filter strips.*
  - b. *External deflector baffles.*

## 2.6 ACCESSORIES

- A. *Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.*
- B. *Elastomeric Flashing Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints and remain watertight; recommended in writing by manufacturer for installation of flashing systems.*
- C. *Roofing Nails: ASTM F1667, aluminum, stainless steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, sharp-pointed, with a 3/8- to 7/16-inch- (10- to 11-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through sheathing less than 3/4 inch (19 mm) thick.*
  1. *Where nails are in contact with metal flashing, use nails made from same metal as flashing.*
- D. *Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, 1-inch- (25-mm-) minimum diameter.*

## 2.7 METAL FLASHING AND TRIM

- A. *Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."*
- B. *Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise specified in this Section or indicated on Drawings.*
  1. *Drip Edges: Fabricate in lengths not exceeding 10 feet (3 m) with minimum 2-inch (51-mm) roof-deck flange and 1-1/2-inch (38-mm) fascia flange with 3/8-inch (10-mm) drip at lower edge.*
  2. *Vent-Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches (102 mm) from pipe onto roof.*



*PART 3 - EXECUTION*

*3.1 EXAMINATION*

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.*
  - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.*
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provisions have been made for flashings and penetrations through asphalt shingles.*
  - 3. Verify that vent stacks and other penetrations through roofing are installed and securely fastened.*
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.*
- C. Proceed with installation only after unsatisfactory conditions have been corrected.*

*3.2 INSTALLATION OF UNDERLAYMENT MATERIALS*

- A. Comply with asphalt shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.*
- B. Synthetic Underlayment:*
  - 1. Install on roof deck parallel with and starting at the eaves.*
    - a. Lap sides and ends as recommended in writing by manufacturer, but not less than 2 inches for side laps and 6 inches (152 mm) for end laps.*
    - b. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer, but not less than 72 inches (1829 mm).*
    - c. Fasten with underlayment nails in accordance with manufacturer's written instructions.*
    - d. Cover underlayment within period recommended in writing by manufacturer.*
  - 2. Install in single layer on roofs sloped at 4:12 and greater.*
  - 3. Install in double layer on roofs sloped at less than 4:12.*
- C. Self-Adhering, Polymer-Modified Bitumen Sheet: Install, wrinkle free, on roof deck.*
  - 1. Comply with low-temperature installation restrictions of underlayment manufacturer.*
  - 2. Install lapped in direction that sheds water.*
    - a. Lap sides not less than 4 inches (102 mm).*

- b. *Lap ends not less than 6 inches (152 mm), staggered 24 inches (610 mm) between succeeding courses.*
- c. *Roll laps with roller.*
3. *Prime concrete, masonry, and metal surfaces to receive self-adhering sheet.*
4. *Eaves: Extend from edges of eaves 24 beyond interior face of exterior wall.*
5. *Rakes: Extend from edges of rakes 24 inches beyond interior face of exterior wall.*
6. *Ridges: Extend 36 inches on each side without obstructing continuous ridge vent slot.*
7. *Cover underlayment within seven days.*

### 3.3 *INSTALLATION OF METAL FLASHING AND TRIM*

- A. *Install metal flashings and trim to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."*
  1. *Install metal flashings in accordance with recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."*
  2. *Bed flanges of metal flashings using asphalt roofing cement or elastomeric flashing sealant.*
- B. *Rake Drip Edges: Install over underlayment materials and fasten to roof deck.*
- C. *Eave Drip Edges: Install below underlayment materials and fasten to roof deck.*
- D. *Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.*

### 3.4 *INSTALLATION OF ASPHALT SHINGLES*

- A. *Install asphalt shingles in accordance with manufacturer's written instructions and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."*
- B. *Install starter strip along lowest roof edge, consisting of an asphalt shingle strip self-sealing strip face up at roof edge.*
  1. *Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.*
  2. *Install starter strip along rake edge.*
- C. *Install first and remaining courses of laminated asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.*
- D. *Fasten asphalt shingle strips with a minimum of four roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated on Drawings and for warranty requirements specified in this Section.*
  1. *Locate fasteners in accordance with manufacturer's written instructions.*

2. *When ambient temperature during installation is below 50 deg F (10 deg C), hand seal self-sealing asphalt shingles by applying asphalt roofing cement spots between course overlaps after nailing the upper course.*
  
- E. *Ridge Vents: Install continuous ridge vents over asphalt shingles in accordance with manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.*
  
- F. *Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing-shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds.*
  1. *Fasten with roofing nails of sufficient length to penetrate sheathing.*
  2. *Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.*

*END OF SECTION 073113*

## SECTION 074113 - STANDING-SEAM METAL ROOF PANELS

### 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. Standing-seam metal roof panels.
2. Metal Fascia and Soffit Panels
3. Gutters and Downspouts
4. Downspout Boots

- B. Related Sections:

1. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel systems during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
  - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
  - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
  - 1. Include similar Samples of trim and accessories involving color selection.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

#### 1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

#### 1.10 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

#### 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    - 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. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E1680 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646[ or ASTM E331] at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- C. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.
- D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
  - 1. Uplift Rating: UL 90.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

### 2.2 STANDING-SEAM METAL ROOF PANELS

- A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
  - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
  - 2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.
- B. Trapezoidal or Vertical Rib, Seamed-Joint, Standing-Seam Metal Roof: Formed with raised vertical or trapezoidal ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. MBCI
  - b. Nucor Building Systems
  - c. Atas International
  - d. Kingspan
  - e. Dimensional Metals, Inc.
  - f. Fabral
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
- a. Nominal Thickness: 0.034, 22-gauge.
  - b. Exterior Finish: Two-coat fluoropolymer.
  - c. Color: As selected by Architect from manufacturer's full range.
3. Clips: Two-piece floating to accommodate thermal movement.
- a. Material: Manufacturer's standard, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
4. Joint Type: Double folded.
5. Panel Coverage: 24 inches.
6. Panel Height: 3.0 inches.

### 2.3 METAL FASCIA AND SOFFIT PANELS

- A. General: Provide factory-formed metal fascia and soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory applied sealant in side laps. Include accessories required for weathertight installation.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. MBCI
    - b. Nucor Building Systems
    - c. Atas International
    - d. Kingspan
    - e. Dimensional Metals, Inc.
    - f. Fabral
- B. Metal Fascia: Provide profile as shown on drawings.
1. Finish: Match finish and color of metal roof panels.
  2. Sealant: Factory applied within interlocking joint.
- C. Metal Soffit Panels: Provide perforated panels formed with vertical panel edges and intermediate stiffening ribs spaced between panel edges; with flush joint between panels.



1. Finish: Match finish and color of metal roof panels.
2. Sealant: Factory applied within interlocking joint.

## 2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D1970.
  2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D1970.
  3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Atas International
    - b. Polyglass USA
    - c. Owens Corning
    - d. Fabral
    - e. Henry company
- B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

## 2.5 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match roof fascia and rake trim.
  - 1. *Box-Style*
  - 2. *Minimum 4" depth and 5" bottom width.*
- E. Downspouts: *3"x4" corrugated rectangular*, formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match metal wall panels.
  - 1. Mounting Straps: Fabricated from same material and finish as gutters spaced 5'-0" o.c.
- F. Downspout Boots: Provide cast iron downspout boots for connection to underground drainage system. Coordinate with Division 33 "Storm Utility Drainage".
- G. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- H. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
  - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
  - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
  - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

## 2.6 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
  - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

## 2.7 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
  1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
  - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

### 3.3 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
  1. Apply over the entire roof surface.
- B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

### 3.4 INSTALLATION OF STANDING SEAM METAL ROOF PANELS

- A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  1. Shim or otherwise plumb substrates receiving metal panels.
  2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  3. Install screw fasteners in predrilled holes.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.
  5. Install flashing and trim as metal panel work proceeds.

6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
  2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
  3. Copper Panels: Use copper, stainless steel, or hardware-bronze fasteners.
  4. Stainless Steel Panels: Use stainless steel fasteners.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
  2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
  4. Watertight Installation:
    - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer to make panels watertight.
    - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    - c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners

where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
1. Connect downspouts to underground drainage system indicated.
- J. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

### 3.5 METAL FASCIA AND SOFFIT PANEL INSTALLATION

- A. In addition to complying with requirements of metal roof panel installation, install metal fascia and soffit panels to comply with requirements in this article.
- B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.
- C. Metal Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fascia meet soffits, along lower panel edges, and at perimeter of all openings.

### 3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Prepare test and inspection reports.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

## SECTION 074213 - FORMED METAL WALL PANELS

### 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. Exposed-fastener, lap-seam metal wall panels.
  - 2. Metal liner panels.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
  - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
  - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
  - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
  - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
  - 7. Review temporary protection requirements for metal panel assembly during and after installation.
  - 8. Review of procedures for repair of metal panels damaged after installation.
  - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.



1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.

1. Include Samples of trim and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
  1. Build mockup of typical metal panel assembly, including corner, soffits, supports, attachments, and accessories.
  2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
  3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

#### 1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

#### 1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

#### 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## 1.12 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Other Design Loads: As indicated on Drawings.
  - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 1.13 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.
  - 1. Panel Height: 1.5 inches.
- B. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. MBCI
    - b. Atas International
    - c. Kingspan
    - d. Dimensional Metals, Inc.
  - 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
    - a. Nominal Thickness: 24 gage.

- b. Exterior Finish: Two-coat fluoropolymer.
  - c. Color: As selected by Architect from manufacturer's full range.
- 3. Major-Rib Spacing: 12 inches o.c.
  - 4. Panel Coverage: 36 inches .
  - 5. Panel Height: 1.5 inches

#### 1.14 METAL LINER PANELS

- A. Provide factory-formed metal liner panels designed for interior side walls and field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for a complete installation.
- B. Metal Liner Panels: Solid panels formed with intermediate stiffening ribs symmetrically spaced between panel edges; with a flush joint between panels.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. MBCI
    - b. Atas International
    - c. Kingspan
    - d. Dimensional Metals, Inc.
  - 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
    - a. Nominal Thickness: 24 gage
    - b. Exterior Finish: Two-coat fluoropolymer.
    - c. Color: As selected by Architect from manufacturer's full range.
  - 3. Panel Coverage: 12 inches to 36 inches.
  - 4. Seam Profile: Flush.
  - 5. Seam Height: 1.5 inches

#### 1.15 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
  2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
  3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

#### 1.16 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
  - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

#### 1.17 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
  1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[ for seacoast and severe environments].
  2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

### PART 2 - EXECUTION

#### 2.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

- a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 2.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

## 2.3 INSTALLATION

- A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  1. Shim or otherwise plumb substrates receiving metal panels.
  2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  3. Install screw fasteners in predrilled holes.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.
  5. Install flashing and trim as metal panel work proceeds.
  6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
  1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
  1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
  2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.

3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Metal Liner Panels: Install panels on interior side of framing with flush appearance on the inside.

G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

## 2.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.



- B. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

## 2.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213

## SECTION 076200 – SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Formed Products:

- a. Formed steep-slope roof sheet metal fabrications.
    - b. Formed wall sheet metal fabrications.

- B. Related Sections:

- 1. Division 06 Section "Rough Carpentry" for nailers, curbs, and blocking.
  - 2. Division 07 Section "Standing-Seam Metal Roof Panels" for sheet metal flashing and trim integral with roof panels.
  - 3. Division 07 Section "Formed Metal Wall Panels" for sheet metal flashing and trim integral with wall panels.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
  - 1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft. (1.00 to 1.44 kPa): 60-lbf/sq. ft. (2.87-kPa) perimeter uplift force, 90-lbf/sq. ft. (4.31-kPa) corner uplift force, and 30-lbf/sq. ft. (1.44-kPa) outward force.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
  - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
  - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 4. Details of termination points and assemblies, including fixed points.
  - 5. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
  - 6. Details of special conditions.
  - 7. Details of connections to adjoining work.
  - 8. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified fabricator.
- B. Warranty: Sample of special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical roof eave, including fascia, fascia trim, and apron flashing, approximately 10 feet (3.0 m) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
  
- D. Preinstallation Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
  - 2. Review methods and procedures related to sheet metal flashing and trim.
  - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
  - 4. Review special roof details, roof drainage, roof penetrations, and condition of other construction that will affect sheet metal flashing.
  - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
  
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

## 1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel 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 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
  - 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
  - 2. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.
  - 3. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 4. Color: As selected by Architect from manufacturer's full range.
  - 5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 1.0 mil (0.026 mm).

### 2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  - 2. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

- C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

### 2.3 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
  - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 2. Obtain field measurements for accurate fit before shop fabrication.
  - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- H. Do not use graphite pencils to mark metal surfaces.

#### 2.4 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
- B. Drip Edges: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
- C. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
- D. Counterflashing: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
- E. Flashing Receivers: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
- F. Roof-Penetration Flashing: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

#### 2.5 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.

### 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.
  - 1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
  5. Install sealant tape where indicated.
  6. Torch cutting of sheet metal flashing and trim is not permitted.
  7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws and metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints as shown and as necessary for watertight construction.



1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
  2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- F. Rivets: Rivet joints in uncoated aluminum, zinc where indicated and where necessary for strength.

### 3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant. Secure in a waterproof manner by means of interlocking folded seam or blind rivets and sealant;
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

### 3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200



## SECTION 077253 - SNOW GUARDS

### 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. Rail-type, seam-mounted snow guards.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.
  - 1. Include details of rail-type snow guards.

#### 1.4 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit adhesive-mounted snow guards to be installed, and adhesive cured, according to adhesive manufacturer's written instructions.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Structural Performance: Snow guards shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
  - 1. Snow Loads: As indicated on Drawings.

## 2.2 RAIL-TYPE SNOW GUARDS

### A. Rail-Type, Seam-Mounted Snow Guards:

1. Manufacturers: Subject to compliance with requirements, provide one of the following:
  - a. Alpine Snowguards
  - b. LM Curbs
  - c. Metal roof Innovations, Ltd.
2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with two rails.
3. Brackets and Baseplate: ASTM A240/A240M, Type 304 stainless steel; mill.
4. Bars: ASTM A240/A240M, Type 304 stainless steel; mill finish.
  - a. Profile: Round
5. Seam clamps: ASTM B221 (ASTM B221M) aluminum extrusion or ASTM B85/B85M aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.
  1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions.
  1. Space rows as recommended by manufacturer.
- B. Attachment for Standing-Seam Metal Roofing:
  1. Do not use fasteners that will penetrate metal roofing or fastening methods that void
  2. Rail-Type, Seam-Mounted Snow Guards:
    - a. Install brackets to vertical ribs in straight rows.
    - b. Secure with stainless steel set screws, incorporating round nonpenetrating point, on same side of standing seam.
    - c. Torque set screw according to manufacturer's instructions.
    - d. Install cross members to brackets.

ODOT - EATON OUTPOST  
DOT-200023

Jerome M. Scott Architects, Inc.

END OF SECTION 077253



## SECTION 064116- ARCHITECTURAL CASEWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Plastic-laminate cabinets.
  - 2. Solid surface countertops.
  - 3. Solid surface window stools.
  - 4. Grommets.
- B. Related Sections include the following:
  - 1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

#### 1.2 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, including plywood, solid-surfacing material, high-pressure decorative laminate, adhesive for bonding plastic laminate, cabinet hardware and accessories.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Show details full size.
  - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  - 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, grommets, and other items installed in architectural casework.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
  - 1. Plastic laminates.
  - 2. Solid-surfacing materials.



3. Cabinet hardware and accessories
- D. Samples for Verification: For the following:
1. Solid-surfacing materials, 6 inches square.
  2. Plastic-laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
  3. Exposed cabinet hardware and accessories, one unit for each type and finish.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

#### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing architectural casework similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Casework Quality Standards" for grades of interior architectural casework, construction, finishes, and other requirements.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until framing and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where casework is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed and indicate measurements on Shop Drawings.
  - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating casework without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural casework can be supported and installed as indicated in the drawings.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of casework and quality grade specified, unless otherwise indicated. All cabinet boxes, drawers and doors to be constructed using plywood construction.
- B. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a pre-coated finish.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Corian; DuPont Polymers.
    - b. Formica Solid Surface; Formica Corporation.
    - c. Wilsonart International
  - 2. Colors and Patterns:
    - a. As selected by Architect from manufacturer's full range. Basis of design:
      - 1) Corian "Silver Birch"

- C. High-Pressure Decorative Laminate: NEMA LD 3, grade HGS.
  - 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
    - a. Wilsonart International; Div. of Premark International, Inc.
    - b. Nevamar Decorative Surfaces.
    - c. Formica Corporation
  - 2. Colors and Patterns:
    - a. As selected by Architect from manufacturer's full range. Basis of design:
      - 1) Wilsonart "Harvest Maple" (Vertical Casework)
- D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

## 2.2 HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- D. Wire Pulls: Back mounted, 4 inches (100 mm) long, 5/16 inches (8 mm) in diameter.
- E. Shelf Rests: BHMA A156.9, B04013.
- F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
  - 1. Box Drawer Slides: 100 lbf (440 N).
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
  - 2. Satin Stainless Steel: BHMA 630.
- J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

- K. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
  - 1. Provide Grommets 4'-0" o.c. (refer to drawings for locations).

## 2.3 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as directed for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Miscellaneous metal brackets and supports: Fabricated steel brackets and supports made from tube steel, metal plate and angles to support cabinets and counters.

## 2.4 FABRICATION, GENERAL

- A. Include necessary steel structure in cabinets and counters to accommodate the needs of the unit.
- B. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify A/E seven days in advance of the dates and times cabinet fabrication will be complete.
  - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

## 2.5 SOLID-SURFACING-MATERIAL COUNTER TOPS AND WINDOW STOOLS

- A. Quality Standard: Comply with AWI Section 400 Custom Grade requirements for countertops.
- B. Solid-Surfacing-Material Thickness: 1/2 inch.

## 2.6 PLASTIC-LAMINATE CABINETS

- A. Quality Standard: Comply with AWI Section 400 Custom Grade requirements for laminate cabinets.

- B. AWI Type of Cabinet Construction: Flush overlay
- C. Base construction material: Plywood with laminate finish on exposed and semi-exposed surfaces.
- D. Reveal Dimension: 1/8 inches.
- E. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
  - 1. Grade: Custom
  - 2. Horizontal Surfaces Other Than Tops: HGS.
  - 3. Postformed Surfaces: HGP.
  - 4. Vertical Surfaces: HGS.
  - 5. Edges: PVC tape, 0.018-inch (0.460-mm) minimum thickness, matching laminate in color, pattern, and finish.
- F. Materials for Semi-exposed Surfaces: Provide surface materials indicated below:
  - 1. Surfaces Other Than Drawer Bodies: Plywood with white laminate finish.
  - 2. Drawer Sides and Backs: Plywood with white laminate finish.
  - 3. Drawer Bottoms: Plywood with white laminate finish.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Condition casework to average prevailing humidity conditions in installation areas before installation.
- B. Before installing architectural casework, examine shop-fabricated work for completion and complete work, including removal of packing and back-priming.

### 3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Shim with concealed shims to complete installation within these tolerances.
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as specified herein.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
  - 1. Fabricate counter tops in one piece with shop-applied edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
  - 2. When Seams are required align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  - 3. Install all countertops and sills with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 4. Seal space between countertop and wall with sealant; color, to match solid surface material, strike bead flush with sill.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064116



## SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes:
  - 1. Interior standard steel doors and frames.
  - 2. Exterior standard steel doors and frames.
- B. Related Requirements:
  - 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

#### 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

#### 1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door type.
  - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.



5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door Products; an Assa Abloy Group company.
  2. Curries Company; an Assa Abloy Group company.
  3. Steelcraft; an Ingersoll-Rand company.
  4. Republic Doors and Frames

### 2.2 PERFORMANCE REQUIREMENTS

- A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg Btu/F x h x sq. ft. (2.27 W/K x sq. m) when tested according to ASTM C518.

## 2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule.
  - 1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches (44.5 mm).
    - c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
    - d. Edge Construction: Model 1, Full Flush.
    - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
    - f. Core: Manufacturer's standard.
  - 2. Frames:
    - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
    - b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
    - c. Construction: Full profile welded.
  - 3. Exposed Finish: Prime.

## 2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule.
  - 1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches (44.5 mm).
    - c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum A60 (ZF180) coating.
    - d. Edge Construction: Model 1, Full Flush.
    - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
    - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
    - g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
    - h. Core: Manufacturer's standard.

2. Frames:
  - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) coating.
  - b. Construction: Full profile welded.
3. Exposed Finish: Prime.

## 2.5 BORROWED LITES

- A. Fabricate of metallic-coated steel sheet, minimum thickness of [0.053 inch (1.3 mm)] [0.042 inch (1.0 mm)].
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

## 2.6 FRAME ANCHORS

- A. Jamb Anchors:
  1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
  2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
  3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
  1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

## 2.7 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 088000 "Glazing."

## 2.8 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as directed by A/E to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  - 1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
  - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
  2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
  4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
  5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

## 2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
    - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    - b. Install frames with removable stops located on secure side of opening.
  2. Floor Anchors: Secure with postinstalled expansion anchors.
  3. Solidly pack mineral-fiber insulation inside frames.
  4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
- 3.3 REPAIR
- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
  - B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
  - C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113



## SECTION 082220- FIBERGLASS REINFORCED PLASTIC DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Fiberglass doors and frames.

- B. Related Sections:

- 1. Division 08 Section "Door Hardware" for door hardware for doors.
  - 2. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

- B. Shop Drawings: Include the following:

- 1. Elevations of each door design.
  - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, joints, field splices, and connections.
  - 7. Details of accessories.
  - 8. Details of moldings, removable stops, and glazing.
  - 9. Details of conduit and preparations for power, signal, and control systems.

- C. Samples for Verification:

- 1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 125 mm).
  - 2. For the following items, prepared on Samples about 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:



- a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
- b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

D. Other Action Submittals:

1. Schedule: Provide a schedule of prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 PERFORMANCE REQUIREMENTS

- A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg Btu/F x h x sq. ft. (2.27 W/K x sq. m) when tested according to ASTM C518.

1.9 WARRANTY

All fiberglass doors and frames have a lifetime guarantee against failure due to corrosion. Additionally, fiberglass doors and fiberglass frames are guaranteed for ten years against failure due to materials and workmanship, including warp, separation or delamination, and expansion of the core.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Curries Company
  - 2. Corrim Company
  - 3. Chempruf
  - 4. Tiger Door
- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

### 2.2 FIBERGLASS REINFORCED PLASTIC DOORS

- A. Doors shall be made of fiberglass reinforced plastic (FRP) using Class 1 premium resin with no fillers that is specifically tailored to resist chemicals and contaminants typically found in environment for which these specifications are written. Doors shall be 1 ¾ inch thick and of flush construction, having no seams or cracks. For consistency in the resin chemistry tailored for this application and to maintain the same physical properties throughout the structure, all fiberglass components including face plates, stiles and rails and frames must be fabricated by the same manufacturer. Components obtained through various outside sources for plant assembly will not be accepted.
- B. Door Plates shall be 0.125 inch thick minimum, molded in one continuous piece, starting with 25 mil gelcoat of the color specified, integrally molded with multiple layers of 1.5 ounces per square foot fiberglass mat and one layer of 18 ounce per square yard fiberglass woven roving. Each layer shall be individually laminated with resin as mentioned above. Door plate weight shall not be less than 0.97 lbs per square foot at a ratio of 30/70 glass to resin. Plate alone to withstand Large Missile Impact per FBC TAS 201. Face plates manufactured using the pultrusion process does not allow for a smooth molded gelcoat finish, the use of woven roving for adequate plate thickness, strength and weight, or the appropriate glass to resin ratio and will not meet the quality standards of this project.
- C. Stiles and Rails shall be constructed starting from the outside toward the inside, with a matrix of at least three layers of 1.5 ounce per square foot of fiberglass mat. The stile and rail shall be molded in one continuous piece to a U-shaped configuration and to the exact dimensions of the door. In this manner there will be no miter joints and disparate materials used to form the one-piece stile and rail.
- D. Core material shall be Polypropylene plastic honeycomb core with a non woven polyester veil for unparalleled plate bonding, 180 PSI typical compression range unless otherwise requested.
- E. Internal Reinforcement shall be #2 SPF of sufficient amount to adequately support required hardware and function of same.

- F. Finish of door frame shall be identical with 25 mil resin-rich gelcoat of the specified color integrally molded in at time of manufacture resulting in a smooth gloss surface that is dense and non-porous. To achieve optimum surface characteristics, the gelcoat shall be cured within a temperature range of 120F to 170F creating an impermeable outer surface, uniform color throughout, and a permanent homogeneous bond with the resin/fiberglass substrate beneath. Only the highest quality gelcoat will be used to ensure enduring color and physical properties. Paint and/or post application of gelcoat results in poor mechanical fusion and will be deemed unacceptable for this application. The finish of the door and frame must be field repairable without compromising the integrity of the original uniform composite structure, function or physical strength.

### 2.3 DOOR FRAMES

- A. Frames shall be fiberglass and manufactured using the resin transfer method creating one solid piece (no voids) with complete uniformity in color and size. Beginning with a minimum 25 mil gelcoat layer molded in and a minimum of two layers of continuous strand fiberglass mat saturated with resin, the frame will be of one-piece construction with molded stop. All frame profiles shall have a core material of 2 psf polyurethane foam. Metal frames or pultruded fiberglass frames will not be accepted.
- B. Finish of frame shall be identical to the door with 25 mil resin-rich gelcoat of the specified color integrally molded in at time of manufacture. To achieve optimum surface characteristics, the gelcoat shall be cured within a temperature range of 120F to 170F creating an impermeable outer surface, uniform color throughout, and a permanent homogeneous bond with the resin/fiberglass substrate beneath. Only the highest quality gelcoat will be used to ensure enduring color and physical properties. Paint and/or post application of gelcoat result in poor mechanical fusion and will be deemed unacceptable for this application. The finish of the door and frame must be field repairable without compromising the integrity of the original uniform composite structure, function or physical strength.
- C. Jamb/Header connection shall be mitered for tight fit.
- D. Internal Reinforcement shall be continuous within the structure to allow for mounting of specified hardware. Reinforcing material shall be a dense matrix of cloth glass fibers and premium resin with a minimum hinge screw holding value of 1000 lbs per screw. All reinforcing materials shall be completely encapsulated. Documented strength of frame screw holding value after third insert must be submitted. Dissimilar materials, such as steel, will be deemed unacceptable as reinforcement for hardware attachment.
- E. Mortises for hardware shall be accurately machined by CNC to hold dimensions to +/- 0.010 inch in all three axis.
- F. Hinge pockets shall be accurately machined by CNC to facilitate heavy duty hinges at all hinge locations, using shims when standard weight hinges are used.

## 2.4 HARDWARE

- A. Refer to Section 087100
- B. The special nature of this material requires that all related hardware as specified must be furnished and installed by the door frame manufacturer to maintain product quality and function as well as to ensure sufficient support/reinforcement, precision tooling and proper sealing methods are provided.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Doors shall be delivered at job site individually crated. Each crate to be clearly marked with the specific opening information for quick and easy identification.
- B. All single doors to be shipped completely assembled in the frame with hardware installed. Double doors to be prehung at the factory to ensure a proper fit and that hardware functions properly, then disassembled for shipping purposes.
- C. Install door opening assemblies in accordance with shop drawings and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.
- D. Field alteration of doors or frames to accommodate field conditions is strictly prohibited.
- E. Site tolerances: Maintain plumb and level tolerance specified in manufacturer's printed installation instructions.

Fire labeled doors, frames and any associated hardware must be installed by qualified professional installers in strict accordance with manufacturer's instructions and the latest revision of NFPA 80.

3.3 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including work that is warped, bowed, or otherwise unacceptable.
- B. Clean surfaces of door opening assemblies and exposed door hardware in accordance with respective manufacturer's maintenance instructions.

END OF SECTION 082220

## SECTION 083113 - ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Access doors and frames.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches (150 by 150 mm) in size.

### PART 2 - PRODUCTS

#### 2.1 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. J. L. Industries, Inc.
    - b. Karp Associates, Inc.
    - c. Larsen's Manufacturing Company.
    - d. Milcor Inc.
    - e. Nystrom, Inc.
  - 2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
  - 3. Locations: Ceiling.
  - 4. Door Size: 22"x36"
  - 5. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gage, factory primed.
  - 6. Frame Material: Same material, thickness, and finish as door.
  - 7. Latch and Lock: Cam latch, screwdriver operated with interior release.

## 2.2 MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- B. Frame Anchors: Same material as door face.
- C. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

## 2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Latch and Lock Hardware:
  - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.

## 2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113





## SECTION 083613 - OVERHEAD SECTIONAL DOORS

### 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 electrically operated sectional doors.
- B. Related Sections:
  - 1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
  - 2. Division 08 Section "Door Hardware" for lock cylinders and keying
  - 3. Division 08 Section "Wash Bay Overhead Sectional Door" for Wash Bay Doors.
  - 4. Division 26 Sections for electrical service and connections for powered operators and accessories.

#### 1.3 DEFINITIONS

- A. Operational Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
- B. Structural Performance: Exterior sectional doors shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
  - 2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components. Deflection of door in horizontal position (open) shall not exceed 1/120 of the door width.
- C. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283.
  - 1. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h).

- D. Operation Cycles: Provide sectional door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory. Include the following:
  - 1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
  - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. 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: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
  - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Flat Door Sections: 6 inches square.
  - 2. Frame for Paneled Door Sections: 6 inches long of each width of stile and rail required.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Warranties: Sample of special warranties.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.

#### 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

- B. Source Limitations: Obtain sectional doors from single source from single manufacturer.
  - 1. Obtain operators and controls from sectional door manufacturer.
- C. 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.
- D. Standard for Sectional Doors: Fabricate sectional doors to comply with DASMA 102 unless otherwise indicated.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities".

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Faulty operation of hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
    - d. Delaminating of exterior or interior facing materials.
  - 2. Warranty Period: Five years from date of Final Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Warranty Period: 10 years from date of Final Completion.

## PART 2 - PRODUCTS

### 2.1 DOOR ASSEMBLY

- A. Steel Sectional Door: Sectional door formed with hinged sections.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
    - a. Clopay Building Products; a Griffon company.
    - b. Haas Door; a Nofziger company
    - c. Overhead Door Corporation
    - d. Wayne-Dalton Corp

B. Electric Door Operators

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
  - a. Overhead Door Corp.
  - b. Liftmaster The Chamberlain Group, Inc
  - c. The Genie Company

2.2 STEEL DOOR SECTIONS

- A. Exterior Section Faces and Frames: Fabricate from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with G60 (Z180) coating designation.
  1. Fabricate section faces from single sheets to provide sections not more than 24 inches high and 2 inches (51mm) deep. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weathertight seal, with a reinforcing flange return.
  2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.
- B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch- nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch- thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.
- C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile and allowing installation of astragal.
- D. Reinforce sections with continuous horizontal and diagonal reinforcement, to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place. Ensure that reinforcement does not obstruct vision lites.
- E. Provide reinforcement for hardware attachment.
- F. Foamed-in-Place Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polyurethane insulation, foamed in place to completely fill interior of section and pressure bonded to face sheets to prevent delamination under wind load, and with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within steel sections that incorporate the following interior facing material, with no exposed insulation:
  1. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with 0.022 inch (0.55mm).
  2. Provide U-Value of 0.057 or less.
- G. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

## 2.3 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances shown on Drawings, and complying with ASTM A 653/A 653M for minimum G60 (Z180) zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device. Slope tracks at proper angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
1. Provide a strut that connects from the main spring shaft of the door to the motor shaft, designed to prevent the drive motor torquing up and causing the chain to loosen.
  2. Provide tracks configured for the following lift types:
    - a. High
- B. Track Reinforcement and Supports: Galvanized-steel track reinforcement and support members, complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Secure, reinforce, and support tracks for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
1. Vertical Track Assembly: Track with continuous reinforcing angle attached to track and attached to wall with jamb brackets.
  2. Horizontal Track Assembly: Track with continuous reinforcing angle welded to track and supported at points from curve in track to end of track by laterally braced attachments to overhead structural members.
- C. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
1. Provide motor operated doors with combination bottom weatherseal and sensor edge.
  2. Provide continuous flexible seals at door jambs for weathertight installation.
- D. Windows: Manufacturer's standard full-view window units in arrangement shown.
1. One full-view row at approximate height shown on Drawings; installed with insulated glazing of the following type:
  2. Clear Float Glass: 3 mm thick and complying with ASTM C 1036, Type I, Class 1, Quality Q3.

## 2.4 HARDWARE

- A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch- (2.01-mm-) nominal un-coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where

access to nuts is not possible. Provide double-end hinges where required, for doors over 16 feet (4.88 m) wide unless otherwise recommended by door manufacturer.

- C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- (76-mm-) diameter roller tires for 3-inch- (76-mm-) wide track and 2-inch- (51-mm-) diameter roller tires for 2-inch- (51-mm-) wide track.
  - 1. Tire Material: Case hardened steel.
- D. Push/Pull Handles: For push-up or emergency-operated doors, provide galvanized-steel lifting handles on each side of door.

## 2.5 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
  - 1. Lock Cylinders: Provide cylinders specified in Division 08 Section "Door Hardware" and keyed to building keying system.
  - 2. Keys: Three for each cylinder.
- B. Chain Lock Keeper: Suitable for padlock.

## 2.6 COUNTERBALANCE MECHANISM

- A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from oil tempered steel wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for minimum 10,000 cycles.
- B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet (4.88 m) long and two additional brackets at one-third points to support shafts more than 16 feet (4.88 m) long unless closer spacing is recommended by door manufacturer.
- C. Cables: Galvanized-aircraft-type lifting cables with cable safety factor of at least 5 to 1.
- D. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.
- E. Bracket: Provide anchor support bracket to connect stationary end of spring to the wall and to level the shaft and prevent sag.
- F. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

## 2.7 MANUAL DOOR OPERATORS

- A. Reduction Drive, Chain-Hoist Operator: Side mounted, consisting of endless steel hand chain, chain-pocket wheel and guard, and 3:1 gear-reduction unit with a maximum 35-lbf (155-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

## 2.8 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Comply with NFPA 70.
  - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.
  - 3. Final connections to be by the Electrical Contractor.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
  - 1. Drawbar type, with manual disconnect release for manual operation.
  - 2. Sidemount type, with V-belt and Roller Chain Drive connected to counterbalance shaft and with auxiliary chain-hoist and disconnect switch.
  - 3. Sidemount gear hoist type, with worm and gear – reduction drive, direct couple chain to counter balance shaft and with auxiliary chain hoist and disconnect clutch.
- D. Electric Motors: High-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction from any position, at not less than 2/3 fps (0.2 m/s) and not more than 1 fps (0.3 m/s) without exceeding nameplate ratings or service factor.
  - 1. Type: Polyphase, medium induction type.
  - 2. Service Factor: Comply with NEMA MG 1, unless otherwise indicated.
  - 3. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
  - 4. Provide open drip-proof type motor, and controller with NEMA ICS 6, Type 1 enclosure, ¾ HP, 120V, 1-Phase.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.



1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
    - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensor device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
  2. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.
  - G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
    1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
  - H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 35 lbft (155 N).
  - I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
  - J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
  - K. Radio Control System Consisting of the following:
    1. Three-channel universal coaxial receiver to open, close, and stop door; one per operator.
    2. Multi-function remote controls (Qty 10) programmed to control all operators on the building.
    3. Remote antenna and mounting kit.
- 2.9 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.

## 2.10 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Finish: Manufacturer's standard finish. Color as selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks:
  - 1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches (610 mm) apart.
  - 2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement for rigid installation of track and door-operating equipment.
  - 3. Repair galvanized coating on tracks according to ASTM A 780.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

### 3.3 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weathertight fit around entire perimeter.
- D. Align and adjust motors, pulleys, belts, sprockets, chains, and controls according to manufacturer's written instructions.
- E. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780. All damaged galvanized surfaces including but not limited to, doors, frames, and supports shall have the galvanizing repaired.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083613

## SECTION 083614 - WASH BAY OVERHEAD SECTIONAL DOORS

### 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 electrically operated sectional doors.
- B. Related Sections:
  - 1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
  - 2. Division 08 Section "Door Hardware" for lock cylinders and keying
  - 3. Division 26 Sections for electrical service and connections for powered operators and accessories.

#### 1.3 DEFINITIONS

- A. Operational Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
- B. Structural Performance: Exterior sectional doors shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
  - 2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components. Deflection of door in horizontal position (open) shall not exceed 1/120 of the door width.
- C. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283.
  - 1. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h).

- D. Operation Cycles: Provide sectional door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory. Include the following:
  - 1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
  - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. 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: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
  - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Flat Door Sections: 6 inches (150 mm) square.
  - 2. Frame for Paneled Door Sections: 6 inches (150 mm) long of each width of stile and rail required.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Warranties: Sample of special warranties.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain sectional doors from single source from single manufacturer.
  - 1. Obtain operators and controls from sectional door manufacturer.
- C. 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.
- D. Standard for Sectional Doors: Fabricate sectional doors to comply with DASMA 102 unless otherwise indicated.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities".

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Faulty operation of hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
    - d. Delaminating of exterior or interior facing materials.
  - 2. Warranty Period: Five years from date of Final Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Warranty Period: 10 years from date of Final Completion.

## PART 2 - PRODUCTS

### 2.1 DOOR ASSEMBLY

- A. Steel Sectional Door: Sectional door formed with hinged sections.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

- a. Clopay Building Products; a Griffon company.
  - b. Haas Door; a Nofziger company
  - c. Overhead Door Corporation
  - d. Wayne-Dalton Corp
- B. Electric Door Operators: subject to compliance provide overhead door systems from one of the following:
- a. Overhead Door Corp.
  - b. Liftmaster The Chamberlain Group, Inc
  - c. The Genie Company

## 2.2 STEEL DOOR SECTIONS

- A. Exterior Section Faces and Frames: Fabricate from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with G60 (Z180) coating designation.
1. Fabricate section faces from single sheets to provide sections not more than 24 inches high and 2 inches (51mm) deep. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weathertight seal, with a reinforcing flange return.
  2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.
- B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch- nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch- thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.
- C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile and allowing installation of astragal.
- D. Reinforce sections with continuous horizontal and diagonal reinforcement, to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place. Ensure that reinforcement does not obstruct vision lites.
- E. Provide reinforcement for hardware attachment.
- F. Foamed-in-Place Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polyurethane insulation, foamed in place to completely fill interior of section and pressure bonded to face sheets to prevent delamination under wind load, and with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within steel sections that incorporate the following interior facing material, with no exposed insulation:
1. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with 0.022 inch (0.55mm).
  2. Provide U-Value of 0.057 or less.

- G. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

## 2.3 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Manufacturer's standard, stainless-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances shown on Drawings. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of roller guides for required door type and size. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device. Slope tracks at proper angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
  - 1. Provide a strut that connects from the main spring shaft of the door to the motor shaft, designed to prevent the drive motor torquing up and causing the chain to loosen.
  - 2. Provide tracks configured for the following lift types:
    - a. High
  - 3. Wash Bay Track, reinforcement, hanging brackets, rollers, and any other associated metal hardware, or component of the system shall be stainless steel.
- B. Track Reinforcement and Supports: Stainless steel track reinforcement and support members. Secure, reinforce, and support tracks for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
  - 1. Vertical Track Assembly: Track with continuous reinforcing angle attached to track and attached to wall with jamb brackets.
  - 2. Horizontal Track Assembly: Track with continuous reinforcing angle welded to track and supported at points from curve in track to end of track by laterally braced attachments to overhead structural members.
- C. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
  - 1. Provide motor operated doors with combination bottom weatherseal and sensor edge.
  - 2. Provide continuous flexible seals at door jambs for weathertight installation.
- D. Windows: Manufacturer's standard full-view window units in arrangement shown.
  - 1. One full-view row at approximate height shown on Drawings; installed with insulated glazing of the following type:
  - 2. Clear Float Glass: 3 mm thick and complying with ASTM C 1036, Type I, Class 1, Quality Q3.

## 2.4 HARDWARE

- A. General: Provide heavy-duty, corrosion-resistant hardware, stainless-steel fasteners, to suit door type.



- B. Hinges: Heavy-duty, stainless-steel hinges at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with stainless steel bolts and stainless steel lock nuts or stainless steel lock washers and nuts. Provide double-end hinges where required, for doors over 16 feet (4.88 m) wide unless otherwise recommended by door manufacturer.
- C. Rollers: Heavy-duty rollers with stainless steel ball-bearings in stainless steel raceways, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide high density Polyethylene 3-inch- (76-mm-) diameter roller tires for 3-inch- (76-mm-) wide track and 2-inch- (51-mm-) diameter roller tires for 2-inch- (51-mm-) wide track.
- D. Push/Pull Handles: For push-up or emergency-operated doors, provide stainless-steel lifting handles on each side of door.

## 2.5 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
  - 1. Lock Cylinders: Provide cylinders specified in Division 08 Section "Door Hardware" and keyed to building keying system.
  - 2. Keys: Three for each cylinder.
- B. Chain Lock Keeper: Suitable for padlock.
- C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

## 2.6 COUNTERBALANCE MECHANISM

- A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from 302 series stainless steel wire, mounted on torsion shaft made of stainless steel tube or solid stainless steel. Provide springs designed for number of operation cycles indicated.
- B. Cable Drums and Shaft for Doors: Stainless steel casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's stainless steel ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet (4.88 m) long and two additional brackets at one-third points to support shafts more than 16 feet (4.88 m) long unless closer spacing is recommended by door manufacturer.
- C. Cables: Stainless steel lifting cables with cable safety factor of at least 5 to 1.
- D. Cable Safety Device: Include a spring-loaded stainless steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

- E. Bracket: Provide stainless steel anchor support bracket to connect stationary end of spring to the wall and to level the shaft and prevent sag.
- F. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

## 2.7 MANUAL DOOR OPERATORS

- A. Reduction Drive, Chain-Hoist Operator: Side mounted, consisting of endless steel hand chain, chain-pocket wheel and guard, and 3:1 gear-reduction unit with a maximum 35-lbf (155-N) force for door operation. Provide stainless-steel hand chain with chain holder secured to operator guide.

## 2.8 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
  - 1. Comply with NFPA 70.
  - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.
  - 3. Final connections to be by the Electrical Contractor.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
  - 1. Drawbar type, with manual disconnect release for manual operation.
  - 2. Sidemount type, with V-belt and Roller Chain Drive connected to counterbalance shaft and with auxiliary chain-hoist and disconnect switch.
  - 3. Sidemount gear hoist type, with worm and gear – reduction drive, direct couple chain to counter balance shaft and with auxiliary chain hoist and disconnect clutch.
- D. Electric Motors: High-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction from any position, at not less than 2/3 fps (0.2 m/s) and not more than 1 fps (0.3 m/s) without exceeding nameplate ratings or service factor..
  - 1. Type: Polyphase, medium induction type.
  - 2. Service Factor: Comply with NEMA MG 1, unless otherwise indicated.
  - 3. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
  - 4. Provide totally enclosed, non-ventilated or fan cooled motor fitted with plugged drain, and controller with NEMA ICS 6, Type 4 enclosure, at wash bay locations.

- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
  - 1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
    - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensor device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
  - 2. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.
- G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
  - 1. Wash Bay units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 35 lbft (155 N).
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Portable Radio-Control System: Refer to Specification Section 08 36 13 "Overhead Sectional Doors" for portable radio control system remote configuration and quantities.

## 2.9 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.

## 2.10 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Finish: Manufacturer's standard finish. Color as selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks:
  - 1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches (610 mm) apart.
  - 2. Hang horizontal track assembly from structural overhead framing with stainless steel angles or stainless steel channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement for rigid installation of track and door-operating equipment.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

### 3.3 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weathertight fit around entire perimeter.
- D. Align and adjust motors, pulleys, belts, sprockets, chains, and controls according to manufacturer's written instructions.
- E. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780. All damaged galvanized surfaces including but not limited to, doors, frames, and supports shall have the galvanizing repaired.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083614

## SECTION 083614 (ALTERNATE) WASH BAY HIGH SPEED ROLLING DOORS

### 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 high speed rolling doors for wash bay.
- B. Related Sections:
  - 1. Division 26 Sections for electrical service and connections for powered operators and accessories.

#### 1.3 REFERENCES

- A. NEMA – National Electrical Manufacturers Association.
- B. LED – Light Emitting Diode.

#### 1.4 SYSTEM DESCRIPTION

- A. Electrical Motor operated unit with manual override in case of power failure.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: Provide general construction, component connections and details, and electrical equipment, operation instructions, and information.
- B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
  - 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. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment, and alignment procedures.
- D. Samples: Submit color samples of door panel for A/E selection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For rolling doors to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Furnish high-speed roll doors and all components and accessories by one manufacturer.
- B. Specific door model used must have a proven track record of successful installations in similar applications of no less than 10 years. Verification to be provided upon request.
- C. Regulatory Requirements: Electrical components NEMA approved and UL listed.

1.9 WARRANTY

- A. 5-year limited warranty on motor and 3-ply panel material.
- B. 2-year limited warranty on mechanical/electrical components.
- C. Lifetime warranty on door counterweight and tension spring.

PART 2 - PRODUCTS

2.1 DOOR ASSEMBLY

- A. High Speed Rolling Doors:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
    - a. Rytec Corporation Fast-Seal (Basis of Design)
    - b. TNR Industrial Doors
    - c. Wayne Dalton
  - 2. Opening Dimensions: 16' wide x 14' high

2.2 MATERIALS

- A. Door Panel: Minimum 86 oz., 0.10 inch thick, 3-ply material.
  - 1. Panel material to be multi-layered, woven, dimensionally stable, puncture resistant, polymer impregnated, multi-filament polyester fabric. Rubber panel materials will not be accepted.

2. Door panel material to be laterally stiff and vertically flexible. Materials that are flexible both vertically and laterally will not be accepted.
  3. Four (4) 24" x 24" replaceable PVC windows in door panel. Windows that are sewn, heat welded or mechanically fastened to panel in any way will not be accepted.
  4. Two 4.5" diameter aluminum strapped windbars – one on each side of door panel - for enhanced wind/pressure resistance. Windbars must travel independently and not be integrated into the door panel.
- B. Side Guards: Fully transparent, impact resistant material.
- C. Side Frames: 11-gauge reinforced side frames with front and rear wind bar guides and 14-gauge hinged access covers
1. Dual, full-height brush weatherseal to seal against both sides of the door panel.
- D. Sloped Hood: 14-gauge sloped hood over roll and motor.
- E. Bottom Bar: Rigid aluminum breakaway bottom bar capable of releasing from side columns when hit from either direction without damaging or bending of bottom bar, safety astragal, or side covers.
1. Bottom bar to have the ability to be reset - without tools, equipment, replacement parts or replacement hardware – after it has been impacted and broken away.
  2. Dual “kill” switches to automatically shut off motor when door is impacted. Door movement is to stop immediately upon bottom bar releasing from side columns – no continued movement allowed.
  3. Bottom bar to be completely wireless. Reversing edge signal is carried to the door controller via radio frequency. Doors using coil cords or wired connections of any kind will not be accepted.
    - a. Wireless system to provide control-reliable, two-way communication between the bottom bar and the door controls for safety.
    - b. During door operation, time lapse of communication between bottom bar and door controls shall not exceed 5 milliseconds.
    - c. Estimated battery life of wireless system to be no less than 3 years. Control box to indicate the need for battery replacement before low power is detected.
    - d. Wireless system to employ frequency-hopping technology to prevent “cross talk” and RFID interference.
    - e. Wireless system firmware to be upgradeable for future updates/enhancements without requiring additional wiring or components.
    - f. Bottom bar pre-assembled on door at factory
- F. Counterbalance: Dual, guided counterweights to assist motor in operation of door.
1. Counterweights to be custom-sized for each door to provide proper balancing.
  2. Direct drive doors without a counterbalance system to assist motor or doors using springs or other mechanisms that wear and require replacement for counterbalance will not be accepted.
- G. Panel Tensioning System: Independent curtain tensioning system to include polyester belting and UHMW spools.
1. Tensioning system must be independent of counterbalance system and not utilize the same components.
  2. Curtain tensioning system must maintain constant tension on door curtain.



3. Doors without a tensioning system or doors without a separate counterbalance and tensioning system will not be accepted.
- H. Drive System: Variable-speed AC Drive provides soft acceleration and deceleration.
1. Floor accessible brake release allows push/pull manual operation of the door in the event of a power failure.
  2. Doors using a motor with a clutch, brake or pump to start/stop door movement will not be accepted.
- I. Travel Speed: Opens at up to 50” per second and closes at 21” per second.
1. Speed to be independently adjustable using touchpad on face of control box.
- J. Electrical Controls: Housed in a UL/cUL listed, NEMA 4X rated, impact-resistant polycarbonate plastic enclosure with factory set parameters.
1. Two-line, vacuum fluorescent display provides scrolling self-diagnostic and status messaging as well as quick, straightforward installation and control adjustments.
  2. Tamperproof cycle counter viewable without opening enclosure.
  3. Programming and adjustments made using touchpad on face of control box.
    - a. Control panels that require a portable computer unit, additional components or other devices for programming and/or troubleshooting will not be accepted.
  4. Door control panel to provide power for all ancillary safety and activation items that are supplied with the door. No separate power source for these items to be required.
- K. Travel Limits: Door to use absolute rotary encoder to regulate door travel limits.
1. Limits to be adjustable without the use of tools from floor level at the control panel.
  2. Control software to incorporate a self-adjusting limit feature, the software monitors the door position and adjusts the limits to maintain a proper seal.
  3. Doors using mechanical limits switches or doors that require access to the operator in order to adjust limits will not be accepted.
- L. Safety Devices:
1. Two (2) thru-beam photo eyes mounted within the door side columns.
  2. Full-width, dual-chambered pneumatic reversing edge along bottom of door instantly stops and reverses door to its full open limit when coming into contact with an obstruction above floor line during downward travel. Doors without a bottom reversing edge for redundant safety will not be accepted.
  3. Pathwatch LED Safety Light System
    - a. 36” high x 0.375” wide LED light strips mounted to door side columns at eye level.
    - b. Amber colored lights flash to indicate the door is about to close and red lights illuminate and remain steady to indicate the door is closing
    - c. Safety light system must be mounted at the door threshold at eye level for maximum visibility and safety from both sides of the opening.
    - d. All wiring for safety lights to be concealed within door.
- M. Finish/Color: All components factory finished. Fabric color to be selected by owner from manufacture’s standard color options.

### PART 3 - EXECUTION

#### 3.1 COORDINATION

- A. Coordinate the work with installation of electrical power and locations and sizes of conduit.

#### 3.2 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Verify that opening sizes, tolerances, and conditions are acceptable and in accordance with shop drawings.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.3 INSTALLATION

- A. Install door unit assembly in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Fit and align assembly including hardware; level to plumb to provide smooth operation.

#### 3.4 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

#### 3.5 ADJUSTING

- A. Adjust door and operating assemblies.
- B. Test and adjust doors, if necessary, for proper operation.

#### 3.6 CLEANING

- A. Clean door and all components.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain rolling doors.

END OF SECTION 083614

## SECTION 084313 - ALUMINUM-FRAMED STOREFRONTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Aluminum-framed storefront systems.
- B. Related Requirements:
  - 1. Section 088000 "Glazing"

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
- C. Samples for Initial Selection: For units with factory-applied color finishes.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: For aluminum-framed storefronts, accessories, and components, from manufacturer.
  - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed storefront.
- B. Product Test Reports: For aluminum-framed storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed storefronts to include in maintenance manuals.

## 1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures, including, but not limited to, excessive deflection.
    - b. Noise or vibration created by wind and thermal and structural movements.
    - c. Water penetration through fixed glazing and framing areas.
  2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Warranty Period: 20 years 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:
- a. YKK AP America Inc.
  - b. EFCO Corporation
  - c. Kawneer North America
  - d. Tubelite
- B. Source Limitations: Obtain all components of aluminum-framed storefront system, including framing and accessories, from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- B. Structural Loads:
1. Design Loads: As indicated on Drawings.
- C. Deflection of Framing Members Supporting Glass: At design wind load, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m).
  2. Deflection Parallel to Glazing Plane: Limited to [amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm)].
- D. Structural: Test in accordance with ASTM E330/E330M as follows:
1. When tested at positive and negative wind-load design pressures, storefront assemblies do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- F. Energy Performance: Certified and labelled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
    - a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.57 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.
  2. Air Leakage:

- a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa) when tested in accordance with ASTM E283.
3. Condensation Resistance Factor (CRF):
  - a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.
- G. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
  1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.3 ALUMINUM-FRAMED STOREFRONT SYSTEMS

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced to support imposed loads.
  1. Framing Construction: Thermally broken
  2. Glazing System: Retained mechanically with gaskets on four sides.
  3. Glazing Plane: Front.
  4. Finish: High-performance organic finish.
  5. Fabrication Method: Field-fabricated stick system.
  6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  7. Steel Reinforcement: As required by manufacturer.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

## 2.4 GLAZING

- A. Glazing: As specified in Section 088000 "Glazing."

## 2.5 MATERIALS

- A. Sheet and Plate: ASTM B209 (ASTM B209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).
- C. Structural Profiles: ASTM B308/B308M.

## 2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
  - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.
- C. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

## 2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- D. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

## 2.8 ALUMINUM FINISHES

- A. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent PVDF resin by weight in color coat.
  - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 2. Color and Gloss: As selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.



- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Seal perimeter and other joints watertight unless otherwise indicated.
- G. Metal Protection:
  - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
  - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Install joint filler behind sealant as recommended by sealant manufacturer.
- I. Install components plumb and true in alignment with established lines and grades.

### 3.3 ERECTION TOLERANCES

- A. Install aluminum-framed storefronts to comply with the following maximum tolerances:
  - 1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
  - 2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
  - 3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
    - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
  - 4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

END OF SECTION 084313

## SECTION 085113 - ALUMINUM WINDOWS

### 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.
- B. Related Requirements:
  - 1. Section 088000 "Glazing".

#### 1.2 SUMMARY

- A. Section includes aluminum windows.
- B. Related Requirements:

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: For aluminum windows.
  - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples for Initial Selection: For units with factory-applied finishes.
  - 1. Include Samples of hardware and accessories involving color selection.
- D. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Sample Warranties: For manufacturer's warranties.

## 1.5 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. **Installer Qualifications:** An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

## 1.6 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
    - c. Faulty operation of movable sash and hardware.
    - d. Deterioration of materials and finishes beyond normal weathering.
    - e. Failure of insulating glass.
  - 2. **Warranty Period:**
    - a. Window: 20 years from date of Substantial Completion.
    - b. Glazing Units: 20 years from date of Substantial Completion.
    - c. Aluminum Finish: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Source Limitations:** Obtain aluminum windows from single source from single manufacturer.

### 2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. **Product Standard:** Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
  - 1. **Window Certification:** AAMA certified with label attached to each window.
- B. **Performance Class and Grade:** AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
  - 1. **Minimum Performance Class:** AW.
  - 2. **Minimum Performance Grade:** 40.

- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.45 Btu/sq. ft. x h x deg F.
- D. -Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.
- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.
- F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F (67 deg C) ambient; 180 deg F (100 deg C) material surfaces.
- G. Sound Transmission Class (STC): Rated for not less than 34 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.
- H. Outside-Inside Transmission Class (OITC): Rated for not less than 26 OITC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.

## 2.3 ALUMINUM WINDOWS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. YKK AP America Inc.
  - b. EFCO Corporation
  - c. Kawneer North America
- B. Types: Provide the following types in locations indicated on Drawings:
  - 1. Horizontal sliding.
  - 2. Fixed.
- C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
  - 1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- D. Insulating-Glass Units: ASTM E2190.
  - 1. Refer to Specification 088000 "Glazing".
- E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

- F. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
  - 1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- G. Horizontal-Sliding Window Hardware:
  - 1. Sill Cap/Track: Extruded-aluminum track of dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
  - 2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
  - 3. Roller Assemblies: Low-friction design.
- H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- I. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
  - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

## 2.4 ACCESSORIES

- A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- B. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- C. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

## 2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
  - 1. Full, outside for sliding sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
  - 1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

- C. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- (0.28-mm-) diameter, coated aluminum wire.
  - 1. Wire-Fabric Finish: Charcoal gray.

## 2.6 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.8 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

### 3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
  - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

ODOT - EATON OUTPOST  
DOT-200023

Jerome M. Scott Architects, Inc.

END OF SECTION 085113





## SECTION 087100 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Commercial door hardware.
  - 2. Cylinders for doors specified in other Sections.
  - 3. Electrified door hardware.

#### 1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Include details of electrified door hardware and wiring diagrams.
- C. Samples: For each exposed finish.
- D. Door Hardware Schedule: Organized into door hardware sets indicating type, style, function, size, label, hand, manufacturer, fasteners, location, and finish of each door hardware item. Include description of each electrified door hardware function, including sequence of operation.
- E. Keying Schedule: Detail Owner's final keying instructions for locks.
- F. Product certificates.

#### 1.3 QUALITY ASSURANCE

- A. Supplier Qualifications: Person who is or employs a qualified DHI Architectural Hardware Consultant.
- B. Source Limitations: Obtain electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.
- C. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying schedule.
- D. Pre-Installation Conference: Conduct conference at Project site.
- E. Keys: Deliver keys to Owner in person or by registered mail.
- F. Templates: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware.

- G. Standards: Comply with BHMA A156 series standards, Grade 1.
- H. Certified Products: Provide door hardware that is listed in BHMA directory of certified products.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fails in materials or workmanship within warranty period from date of Substantial Completion.
  - 1. Warranty Period for Manual Closers: 10 years.
  - 2. Warranty Period for Exit Devices: 3 years.
  - 3. Warranty Period for Locks: 7 years.
  - 4. All other hardware one year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product: Subject to compliance with requirements, provide the product named for each door hardware item indicated in Door Hardware Sets.
- B. Basis-of-Design Product: Product named for each door hardware item indicated in Door Hardware Sets establishes the basis of design. Provide either the named product or a comparable product by one of the manufacturers specified for each type of hardware item.
- C. Manufacturers Used in the specification:

<u>Products</u>	<u>Manufacture Specified</u>	<u>Acceptable Manufacturers</u>
Hinges	Ives	Hager, Stanley, McKinney
Locksets	Falcon T-Dane	Schlage ND-RHO Stanley 9K-15D Yale 5400
Closers	LCN 4041XP MC	Sargent 281 x MC C-R DC8200 x MC Yale 4400
Overhead Stops	Glynn Johnson	Rixson, ABH
Push/Pulls, Stops	Ives	Hager, Rockwood
Thresholds/Seals	National Guard	Hager, Pemko, Zero
Power	Von Duprin	Stanley, Falcon
Transfers/Supplies		
Cylinders	Falcon (Stanley keyway)	Stanley
Electric Strikes	Von Duprin	Assa Abloy

## 2.2 DOOR HARDWARE

- A. Scheduled Door Hardware: Provide door hardware according to Door Hardware Sets at the end of Part 3. Manufacturers' names are abbreviated.

## 2.3 HINGES

- A. General: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Hinge Base Metal: Unless otherwise indicated, provide the following:
  - 1. Exterior and Wash Bay Hinges: Stainless steel, with stainless-steel pin.
  - 2. Interior Hinges: Steel, with steel pin.
  - 3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.
- C. Non-removable Pins: Provide set screw in hinge barrel that prevents removal of pin while door is closed; for out-swinging exterior doors.
- D. Screws: Phillips flat-head screws; screw heads finished to match surface of hinges.
- E. Metal Doors and Frames: Machine screws (drilled and tapped holes).

## 2.4 MECHANICAL LOCKS AND LATCHES

- A. Cylindrical Locks:
  - 1. Locks shall be ANSI A156.2, Series 4000 Grade 1 UL Listed for 3-hour doors. Manufactured from heavy gauge cold rolled steel mechanisms that are corrosion treated for normal conditions.
  - 2. Locks to have standard 2-3/4" backset with a full 1/2" reversible dead latch. Thru-bolted mounting post for positive interlock to the door with concealed mounting screws.
  - 3. Lever trim shall be pressure cast zinc to match finishes. The design specified, with 3-7/16" diameter roses. Trim shall be applied by "no exposed screws".

## 2.5 EXIT DEVICES

- A. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- B. All lever design shall match mortise or cylindrical lock lever designs.
- C. All devices to incorporate a security dead-latching feature. Provide roller strikes for all rim and surface mounted vertical rod devices, ASA strikes for mortise devices, and manufacturer's standard strikes for concealed vertical rod devices.

## 2.6 CLOSERS

- A. Surface-Mounted Closers:
- B. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and back check.
- C. All closers will not be seen on the public side or hallway side of the door. The appropriate drop plate or mounting plates will be used as conditions dictate.

## 2.7 PROTECTIVE TRIM UNITS

- A. Protective Trim Units: Sized 2" inches less than door width on push side and 1" inch less than door width on pull side, by height scheduled or indicated. Fasten with exposed machine or self-tapping screws.

## 2.8 STOPS AND HOLDERS

- A. Stops and Holders: Provide floor stops for doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
- B. Silencers for Door Frames: Neoprene or rubber; fabricated for drilled-in application to frame.

## 2.9 DOOR GASKETING AND THRESHOLDS

- A. Door Gasketing: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.

## 2.10 CYLINDERS, KEYING, AND STRIKES

- A. Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
- B. Keying System: Factory-registered keying system; grand master key system.

## 2.11 FABRICATION

- A. Base Metals: Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials if different from specified standard.
- B. Fasteners: Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated. Provide steel machine or wood screws or steel through bolts for fire-rated applications.
- C. Spacers or Sex Bolts: For through bolting of hollow metal doors.

- D. Finishes: Comply with BHMA A156.18.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- B. Steel Door and Frame Preparation: Comply with DHI A115 series. Drill and tap doors and frames for surface-applied hardware according to SDI 107.
- C. Mounting Heights: Comply with the following requirements, unless otherwise indicated:
1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
- D. Adjust and reinforce attachment substrates as necessary for proper installation and operation. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
1. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with accessibility requirements.
1. Door Closers: Adjust sweep period so that from an open position of 70 degrees, the door will take at least three seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

#### 3.2 DOOR HARDWARE SETS

Hardware Group No. 01

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRY / OFFICE LOCK	T521B DANE	626	FAL
1	EA	I. CORE	(STANLEY KEYWAY)	626	FAL
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 02

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	T101D DANE	626	FAL
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ MC	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	110SA	CL	NGP
1	EA	THRESHOLD	896S MS/LA	AL	NGP

Hardware Group No. 03

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	T301S DANE	626	FAL
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ MC	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 04

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	T581	626	FAL
1	EA	I. CORE	AS REQUIRED (STANLEY KEYWAY)	626	FAL
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ MC	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	DRIP CAP	17	AL	NGP
1	SET	SEALS	110SA	CL	NGP
1	EA	THRESHOLD	896S MS/LA	AL	NGP
1	EA	ELECTRIC STRIKE	6211FSE CREDENTIAL READER FURNISHED ELSEWHERE	630	VON

**Note: All door hardware inside Wash Bay to be stainless steel.**

Hardware Group No. 05

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	US32D	IVE
1	EA	PASSAGE SET	T101D DANE	626	FAL
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ MC	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE

**Note: All door hardware inside Wash Bay to be stainless steel.**

Hardware Group No. 06

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	T101D DANE	626	FAL
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ MC	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	488SBK PSA	BK	ZER

Hardware Group No. 07

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLTS	FB31P	630	IVE
1	EA	PASSAGE SET	T101D DANE	626	FAL
2	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ MC	689	LCN
2	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
2	EA	MOUNTING BRACKET	MB1F AS REQ'D	689	IVE
1	EA	COORDINATOR	COR X FB	628	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	488SBK PSA	BK	ZER
1	SET	MEETING SEALS	8217SBK PSA	BK	ZER

END OF SECTION 087100





## SECTION 088000 - GLAZING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Glass products.
2. Insulating glass.
3. Glazing sealants.
4. Glazing tapes.
5. Miscellaneous glazing materials.

##### B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames".
2. Section 085113 "Aluminum Windows."

#### 1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
- C. Interspace: Space between lites of an insulating-glass unit.

#### 1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.
  1. Glass Products
  2. Insulating glass.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For glass.
- C. Product Test Reports: For fabricated glass and glazing sealants, for tests performed by a qualified testing agency.
  - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.
- B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

## 1.9 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain glass from single source from single manufacturer.
- B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
  - 1. Design Wind Pressures: As indicated on Drawings.
    - a. Wind Design Data: As indicated on Drawings.
  - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.

- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
  - 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  - 3. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
  - 4. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
  - 5. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.
- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. NGA Publications: "Glazing Manual."
  - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- E. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.
- G. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.
- H. Strength: Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.3 GLASS PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Guardian Glass
  - b. Oldcastle Building Envelope
  - c. Viracon, Inc.
  - d. W.A. Wilson, Inc.

- B. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
- C. Ultraclear Float Glass: ASTM C1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent.
- D. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- E. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

## 2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
  - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.

## 2.5 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.
- B. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.

## 2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
  - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

## 2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks:
  - 1. EPDM with Shore A durometer hardness of 85, plus or minus 5.
  - 2. Type recommended in writing by sealant or glass manufacturer.
- D. Spacers:
  - 1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
  - 2. Type recommended in writing by sealant or glass manufacturer.
- E. Edge Blocks:
  - 1. EPDM with Shore A durometer hardness per manufacturer's written instructions.
  - 2. Type recommended in writing by sealant or glass manufacturer.
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
  1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  2. Provide 1/8-inch- (3-mm-) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.



- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and

installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.8 INSULATING GLASS SCHEDULE

- A. Glass Type GL-1: Low-E-coated, clear insulating glass.

1. Basis-of-Design Product: Guardian; Sunguard SNX 62/27
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Ultraclear heat-strengthened float glass.
5. Interspace Content: Argon.
6. Indoor Lite: Ultraclear heat-strengthened float glass.
7. Low-E Coating: Sputtered on second surface.
8. Winter Nighttime U-Factor: .30 maximum.
9. Visible Light Transmittance: 64 percent minimum.
10. Solar Heat Gain Coefficient: .30 maximum.

### 3.9 MONOLITHIC GLASS SCHEDULE

- A. Clear Glass Type GL-2: Fully tempered float glass.
  1. Minimum Thickness: 6 mm.
  2. Safety glazing required.

END OF SECTION 088000

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### 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. Non-load-bearing steel framing systems
- B. Related Requirements:
  - 1. Section 072100 "Thermal Insulation"

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

### PART 2 - PRODUCTS

#### 2.1 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
  - 2. Protective Coating: ASTM A653/A653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.
- B. 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-steel thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.
  - 1. Subject to compliance with requirements, provide one of the following:
    - a. CEMCO
    - b. Clark Dietrich
    - c. MBA Building Supplies
    - d. SAFCO Steel Stud Company
    - e. Steel Construction Systems

## 2.2 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

## 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. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.

### 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.
- B. Z-Shaped Furring Members:
  - 1. Erect insulation, specified in Section 072100 "Thermal Insulation," horizontally and hold in place with Z-shaped furring members spaced 24 inches 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.
- C. 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.

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DOT-200023

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END OF SECTION 092216



## SECTION 092900 - GYPSUM BOARD

### 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. Interior gypsum board.
- 2. Tile backing panels.
- 3. Metal suspended systems for ceilings and soffits.

- B. Related Requirements:

- 1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Gypsum board, Type X.
- 2. Gypsum ceiling board.
- 3. Glass-mat, water-resistant backing board.
- 4. Interior trim.
- 5. Joint treatment materials.
- 6. Sound-attenuation blankets.

#### 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 C840 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 E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Georgia-Pacific Gypsum LLC.
  2. National Gypsum Company.
  3. USG Corporation.
  4. CertainTeed
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
  1. Thickness: 5/8 inch (15.9 mm).
  2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Gypsum Ceiling Board: ASTM C1396/C1396M.
  1. Thickness: 1/2 inch (12.7 mm).
  2. Long Edges: Tapered.
- D. *Glass-Mat Interior Gypsum Board: ASTM C1658/C1658M. With fiberglass mat laminated to both sides.*
  1. *Core: 1/2 inch (12.7 mm), regular type.*
  2. *Long Edges: Tapered.*
  3. *Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.*

## 2.4 TILE BACKING PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Georgia-Pacific Gypsum LLC.
  - 2. National Gypsum Company.
  - 3. USG Corporation.
  - 4. CertainTeed
- B. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
  - 1. Core: 1/2 inch (12.7 mm), regular type.
  - 2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

## 2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
  - 2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. L-Bead: L-shaped; exposed long flange receives joint compound.
    - d. Expansion (control) joint.

## 2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. Exterior Gypsum Soffit Board: Paper.
  - 3. Tile Backing Panels: As recommended by panel manufacturer.
- 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.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.

4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

## 2.7 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

F. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."

## 2.8 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Steel framing and furring:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. ClarkDietrich Steel Framing Systems.
- b. MBA Building Supplies
- c. Telling Industries

B. Components, General: Comply with ASTM C 754 and ASTM C645 for materials and sizes, unless otherwise indicated.

C. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch diameter wire, or double strand of 0.0475-inch diameter wire.

D. Hangers: As follows:

1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
2. Angle Hangers: ASTM A 653/A 653M, G60, hot-dip galvanized commercial-steel sheet.
  - a. Minimum Base Metal Thickness: 0.0312 inch .
  - b. Size: 1-5/8 by 1-5/8 inches .

- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch- wide flange, with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
  - 1. Depth: 1-1/2 inches.
  
- F. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
  - 1. Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange, 3/4 inch deep.
  - 2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
    - a. Minimum Base Metal Thickness: 0.0179 inch 25 gauge.
  - 3. Furring anchorages: 16 gage galvanized wire ties, manufacturer's standard wire type clips, bolts, nails, or screws as recommended by furring manufacturer and complying with ASTM C754.
  
- G. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
    - b. Chicago Metallic Corporation; System.
    - c. USG Interiors, Inc.; Drywall Suspension System.
  
- H. Fasteners for Metal Framing: of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates. Suspension for ceiling runners must be secured to the structure above with toggle, molly bolts, self drilling anchors, cast-in inserts, or bolts in expansion shields. The use of wood, lead, or plastic plugs and power driven anchors are prohibited. Size devices for three times calculated load supported except size direct pull-out concrete inserts for five times calculated loads

## 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 PREPARATION

- A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

### 3.3 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Suspend ceiling 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 ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
  - 3. Secure wire hangers 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 them to deteriorate or otherwise fail.
  - 4. Secure angle hangers 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 roof deck. Attach hangers to structural members.
  - 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.
- C. Sway-brace suspended steel framing with hangers used for support.
- D. Screw furring to framing.
- E. Wire-tie or clip furring channels to supports to comply with requirements for assemblies indicated.
- F. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
  - 1. Hangers: 48 inches o.c.
  - 2. Carrying Channels (Main Runners): 48 inches o.c.
  - 3. Furring Channels (Furring Members): 16 inches o.c.

- G. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

### 3.3 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- 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. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.4 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Wallboard Type: As indicated on Drawings.
  - 2. Ceiling Type: As indicated on Drawings.
- 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.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

### 3.5 INSTALLATION OF TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.6 INSTALLATION OF 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 according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners.
  - 2. LC-Bead: Use at exposed panel edges.
  - 3. L-Bead: Use where indicated.

### 3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere 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 C840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile.
  - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

### 3.8 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 093000- TILING

### 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. Ceramic tile.
- 2. Metal edge strips.

- B. Related Sections:

- 1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
- 2. Division 09 Section "Gypsum Board" for glass-mat, water-resistant backer board and cementitious backer units.

#### 1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and -grouting product.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

#### 1.7 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile from one source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

## 1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
  - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

- F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

## 2.2 TILE PRODUCTS

### A. Ceramic Tile: Unpolished porcelain tile.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Olean; Division of Dal-Tile International Inc.
  - b. Daltile; Division of Dal-Tile International Inc.
  - c. Deutsche Steinzeug America, Inc.
  - d. Interceramic.
  - e. Lone Star Ceramics Company.
  - f. Grupo Porcelanite.
  - g. Seneca Tiles, Inc.
- 2. Composition: Porcelain.
- 3. Module Size: 12 by 12 inches (50.8 by 50.8 mm).
- 4. Thickness: 3/8 inch (6.35 mm).
- 5. Face: Plain, with square edges.
- 6. Tile Color, Finish, and Pattern: Match Architect's Sample
  - a. Basis of Design: Daltile - Fabrique - Blanc Linen
- 7. Grout Color: As selected by A/E from manufacturer's full range.
- 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. Internal Corners: Field-buttet square corners with expansion joint.

## 2.3 SETTING MATERIALS

### A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Bonsal American; an Oldcastle company.
  - b. Laticrete International, Inc.
  - c. MAPEI Corporation.
  - d. TEC; a subsidiary of H. B. Fuller Company.
- 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
- 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.

4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

## 2.4 GROUT MATERIALS

### A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Bonsal American; an Oldcastle company.
  - b. Laticrete International, Inc.
  - c. MAPEI Corporation.
  - d. TEC; a subsidiary of H. B. Fuller Company.
2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
3. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

## 2.5 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the requirements in Division OM 07 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

## 2.6 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic designed specifically for flooring applications; nickel silver exposed-edge material.
- C. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
  1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

- E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Bonsal American; an Oldcastle company; Grout Sealer.
    - b. Bostik, Inc.; CeramaSeal Siloxane 220.
    - c. MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
    - d. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
    - e. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
    - f. TEC; a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

## 2.7 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

### 3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.



- E. Jointing Pattern: Lay tile in horizontal running bond pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
  - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
  - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. 1/16 inch (1.6 mm).
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
  - 2. Provide vertical expansion joints at internal corners.
  - 3. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- H. Metal Edge Strips: Install at locations indicated:
  - 1. Where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
  - 2. At exterior corners of walls.
- I. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

### 3.4 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove latex-portland cement grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093000



## SECTION 095113 - ACOUSTICAL PANEL CEILINGS

### 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 acoustical panels and exposed suspension systems for interior ceilings.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

#### 1.6 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. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
  - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Class A according to ASTM E1264.
  - 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. CertainTeed
  - 3. USG Interiors, Inc.; Subsidiary of USG Corporation
- B.
- C. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

- D. Classification: Provide panels as follows:
  - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
  - 2. Pattern: CE (perforated, small holes and lightly textured).
- E. Color: White.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.55.
- H. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.
- I. Thickness: 3/4 inch.
- J. Modular Size: 24 by 24 inches.
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

#### 2.4 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. CertainTeed
  - 3. USG Interiors, Inc.; Subsidiary of USG Corporation
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
  - 1. Structural Classification: Intermediate-duty system.
  - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
  - 3. Face Design: Flat, flush.
  - 4. Cap Material: Cold-rolled steel.
  - 5. Cap Finish: Painted white.

## 2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  - a. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
  - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- (2.69-mm-) diameter wire.
- C. Hold-Down Clips: Manufacturer's standard hold-down.

## 2.6 METAL EDGE MOLDINGS AND TRIM

- 1. Armstrong World Industries, Inc.
  - 2. CertainTeed
  - 3. USG Interiors, Inc.; Subsidiary of USG Corporation
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
- 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
  - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

## 2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  - 1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
  - 2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

### 3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
  - 6. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.



- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
  - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  - 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
  - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
  - 1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  - 2. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
  - 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
  - 4. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
    - a. Hold-Down Clips: Space 24 inches (610 mm)] o.c. on all cross runners.

### 3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

## SECTION 096700 - EPOXY FLOORING SYSTEM

### 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. Epoxy flooring
- B. Related sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete "

#### 1.3 SYSTEM DESCRIPTION

- A. The work shall consist of preparation of the substrate, the furnishing and application of a cementitious urethane based self-leveling seamless flooring system with decorative chip broadcast and Epoxy broadcast and topcoats.
- B. The system shall have the color and texture as selected by the Architect from the manufacturer's full range with a nominal thickness of 3/16 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.
- C. 6" high integral cove base to be applied at all locations scheduled to receive epoxy flooring and per manufacturers standard details unless otherwise noted.

#### 1.4 SUBMITTALS

- A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
- B. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.
- C. Manufacturer's standard finish chart for initial selection.
- D. Samples for Verification: Two 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer (applicator) who has specialized in installing epoxy flooring similar in material, design, and extent to that indicated for this Project and who is acceptable to epoxy flooring manufacturer.
  - 1. Engage an installer who is certified in writing by epoxy flooring manufacturer as qualified to install epoxy flooring systems specified.

- B. Source Limitations: Obtain primary epoxy flooring materials, including primers, resins, hardening agents, and sealing or finish coats, through one source from a single manufacturer with a minimum of 5 years verifiable experience providing materials of the type specified in this section. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

#### 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping
  - 1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.
- B. Storage and Protection
  - 1. The Applicator shall be provided with a dry storage area for all components. The area shall be between 60 F and 85 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
  - 2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.
- C. Waste Disposal
  - 1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

#### 1.7 PROJECT CONDITIONS

- A. Site Requirements
  - 1. Environmental Limitations: Comply with epoxy flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting epoxy flooring installation.
  - 2. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during epoxy flooring installation.
  - 3. Close spaces to traffic during epoxy flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.
- B. Conditions of new concrete to be coated with cementitious urethane material.
  - 1. Concrete shall be moisture cured for a minimum of 3 days and have fully cured a minimum of 5 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
  - 2. Concrete shall be finished in accordance with manufacturer's written instructions.
- C. Safety Requirements
  - 1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
  - 2. Non-related personnel in the work area shall be kept to a minimum.

## 1.8 WARRANTY

- A. Manufacturer's standard warranty.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Epoxy Flooring System products are based on Dur-A-Flex, Inc, [www.dur-a-flex.com](http://www.dur-a-flex.com). Subject to compliance with the requirements, products by one of the following manufacturers will be acceptable:

1. Crossfield Products Corp., Dex-O-Tex: Colorflake
2. Stonhard, Stontec
3. *Tennant Coatings*

### 2.1 FLOORING

- A. Basis of Design: Dur-A-Flex, Inc, Hybri-Flex EC (self leveling chip broadcast), epoxy/aliphatic urethane topcoat seamless flooring system.
  1. System Materials:
    - a. Topping: Dur-A-Flex, Inc, Poly-Crete MD resin, hardener and SL aggregate.
    - b. The broadcast aggregate shall be Dur-A-Flex, Inc. Macro or Micro chip.
    - c. Broadcast: Dur-A-Flex, Inc. Dur-A-Glaze #4, epoxy based two-component resin.
    - d. Seal coats: Dur-A-Flex, Inc Dur-A-Glaze #4, epoxy-based, two-component resin.
    - e. Top coat: Dur-A-Flex, Inc. Armor Top aliphatic urethane 2 component resin with grit.
  2. Patch Materials
    - a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Poly-Crete MD (up to ¼ inch).
    - b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Poly-Crete WR.

### 2.3 PRODUCT REQUIREMENTS

- |  |                           |
|--|---------------------------|
| A. Topping                                   | Poly-Crete SL             |
| 1. Percent Reactive                          | 100 %                     |
| 2. VOC                                       | 0 g/L                     |
| 3. Bond Strength to Concrete ASTM D 4541     | 400 psi, substrates fails |
| 4. Compressive Strength, ASTM C 579          | 9,000 psi                 |
| 5. Tensile Strength, ASTM D 638              | 2,175 psi                 |
| 6. Flexural Strength, ASTM D 790             | 5,076 psi                 |
| 7. Impact Resistance @ 125 mils, MIL D-3134, | 160 inch lbs              |
| No visible damage or deterioration           |                           |
| B. Broadcast Coat                            | Dur-A-Glaze #4 Resin      |
| 1. Percent Reactive,                         | 100 %                     |
| 2. VOC                                       | <4 g/L                    |
| 3. Water Absorption, ASTM D 570              | 0.04%                     |

4.	Tensile Strength, ASTM D 638	4000psi
5.	Coefficient of thermal expansion ASTM D 696,	2 x 10 <sup>-5</sup> in/in/F
6.	Flammability ASTM D-635	Self-Extinguishing
7.	Flame Spread/ NFPA 101 ASTM E-84	Class A
C.	Topcoat	Armor Top
1.	VOC	0 g/L
2.	60 Degree Gloss ASTM D523	75+/-5
3.	Mixed Viscosity, (Brookfield 25°C)	500 cps
4.	Tensile strength, ASTM D 638	7,000 psi
5.	Abrasion Resistance, ASTM D4060 CS 17 wheel (1,000 g load) 1,000 cycles	Gloss     Satin 4    8    mg loss with grit 10   12   mg loss without grit
6.	Pot life @ 70° F 50% RH	2 hours
7.	Dry properties,     70°F, 50% R.H. 60°F, 30% RH 80°F, 70%RH	8 hours tack free, 12 hours Dry 12 hours tack free, 18 hours Dry 4 hours tack free, 6 hours Dry
8.	Flash Point PMCC	186°F
9.	Full Chemical resistance	7 days

### PART 3 – EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.
- B. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

#### 3.2 PREPARATION

##### A. General

- 1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
- 2. Moisture Testing: Perform tests recommended by manufacturer and as follows.
  - a. Perform anhydrous calcium chloride test ASTM F 1869-98. Application will proceed only when the vapor/moisture emission rates from the slab is less than and not higher than 20 lbs/1,000 sf/24 hrs.
  - b. Perform relative humidity test using is situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 99% relative humidity level measurement.
- 3. Mechanical surface preparation
  - a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine. All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a

minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.

- b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
- c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
- d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
- e. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

### 3.3 APPLICATION

#### A. General

1. The system shall be applied in five distinct steps as listed below:
  - a. Substrate preparation
  - b. Topping/overlay application with chip broadcast.
  - c. Resin application with chip broadcast.
  - d. Topcoat application
  - e. Second topcoat application.
2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

#### B. Topping

1. The topping shall be applied as a self-leveling system as specified by the Architect. The topping shall be applied in one lift with a nominal thickness of 1/8 inch.
2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. SL Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal surfaces using 1/2 inch "v" notched squeegee, trowels or other systems approved by the Manufacturer.
5. Immediately upon placing, the topping shall be degassed with a loop roller.
6. Chip aggregate shall be broadcast to excess into the wet resin, Macro chip at the rate of 0.1 lbs/sf and Micro chip at the rate of 0.15 lbs/sf.
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose chips.

C. Broadcast

1. The broadcast coat resin shall be applied at the rate of 100 sf/gal.
2. The broadcast coat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part hardener by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
3. Chip aggregate shall be broadcast into the wet resin, Macro chips at the rate of 0.1 lbs/sf, Micro chips at the rate of 0.15 lbs/sf.
4. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose chips.

D. Topcoat

1. The first topcoat shall be squeegee applied with a coverage rate of 100 sf/gal.
2. The topcoat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part hardener by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
3. The first topcoat will be back rolled and cross rolled to provide a uniform texture and finish.
4. The second topcoat with grit shall be roller applied with a coverage rate of 500 sf/gal.
5. The finish floor will have a nominal thickness of 3/16 inch.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection

1. The following tests shall be conducted by the Applicator:
  - a. Temperature
    1. Air, substrate temperatures and, if applicable, dew point.
  - b. Coverage Rates
    1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION 096700

## SECTION 097700- FIBER REINFORCED PLASTIC AND PVC PANELING

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section Includes: Fiberglass reinforced plastic (FRP) paneling for wall and ceiling surfaces, including trim accessories.
- B. Related Sections: Section(s) related to this section include:
  - 1. Division 09 Section "Gypsum Board Assemblies" for panel overlay on to substrate.

#### 1.2 REFERENCES

- A. General: Standards listed by reference form a part of this specification section. Standards listed are identified by issuing authority, abbreviation, designation number, title or other designation. Standards subsequently referenced in this Section are referred to by issuing authority abbreviation and standard designation.
- B. ASTM International:
  - 1. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
  - 2. ASTM D5319 – Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
  - 3. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
  - 4. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. Factory Mutual FM:
  - 1. Installation Guide for FRP Panels #6876.

#### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: Conduct preinstallation meeting to clarify Project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

#### 1.4 ACTION SUBMITTALS

- A. Product Technical Data: For each type of product required.
- B. Shop Drawings: Showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.



- C. Samples: Selection and verification samples for finishes, colors and textures. Submit two samples of each type of panel, trim and fastener.
- D. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria and physical requirements.
- E. Test and Evaluation Reports: Showing compliance with specified performance characteristics and physical properties.
- F. Manufacturer's Instructions: Manufacturer's Installation Guide.
- G. Qualifications Statements: For manufacturer and installer.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For installed products including maintenance methods and precautions against cleaning materials and methods detrimental to finishes and performance.
- B. Warranty: Warranty documents required in this section.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
  - 1. Provider of advanced installer training.
- B. Installer Qualifications:
  - 1. At least five years experience in the installation of fiberglass reinforced plastic panels.
  - 2. Experience on at least five projects of similar size, type and complexity as this Project.
  - 3. Employer of workers for this Project who are competent in techniques required by manufacturer for installation indicated.
- C. Surface-Burning Characteristics: Determined by testing identical products according to ASTM E84 by a testing agency acceptable to authorities having jurisdiction.
  - 1. Flame-Spread Index: 25 or less (Class A)
  - 3. Smoke-Developed Index: 450 or less.
- D. Meets USDA/FSIS requirements.

#### 1.8 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Package sheets on skids or pallets for shipment to project site.

- B. Storage and Handling: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Store panels in a dry indoor location at Project site. Remove any foreign matter from face of panel by using a soft bristle brush, avoiding abrasive action.
- C. Laminated panels shall be stored in a dry place indoors. Exposure to humid or wet conditions prior to installation can cause panel warping. Efforts to limit this exposure during storage can reduce this warpage. Standing water on the surface laminate during storage can cause discoloration.

#### 1.9 PROJECT CONDITIONS

- A. Ambient Conditions:
  - 1. Do not begin installation until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from plaster, concrete or terrazzo work has dissipated.
  - 2. During installation, and within 48 hours prior to installation, maintain ambient temperature and relative humidity within limits required by type of panel adhesive used and recommendation of panel adhesive manufacturer.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace FRP panels that fail within specified warranty period.
  - 1. Failures shall include, but not be limited to substantial defects in material and workmanship, rotting, rusting, corrosion, development of structural surface cracks, or requiring painting or refinishing.
  - 2. Warranty Period: Ten years from date of Substantial Completion.
- B. Special Warranty: Installer's standard form in which installer agrees to repair or replace FRP panels that fail due to poor workmanship or faulty installation within the specified warranty period.
  - 1. Warranty Period: 2 years from date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.1 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS (Truck Storage)

- A. General: Fiberglass reinforced plastic panels complying with ASTM D5319.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Crane Composites, Inc.
  - 2. NUDO Products Inc.
  - 3. Marlite

C. Product Options:

1. Color: As selected by Architect from manufacturer's full range.
2. Surface Finish: Smooth
3. Nominal Thickness: 0.075 inch.
4. Wall Panel Size: 4 feet wide x 8 feet high minimum.
5. Tolerance:
  - a. Length and Width: +/-1/8 inch (3.175mm)
  - b. Square - Not to exceed 1/8 inch for 8 foot (2.4m) panels or 5/32 inch (3.96mm) for 10 foot (2.4m) panels

D. Performance Criteria:

1. Scratch Resistance: ASTM D2583, Barcol Hardness of 45.
2. Abrasion Resistance: Taber Abrasion Test using CS-17 abrasive wheels with 1000 g weight. Panels shall exhibit weight loss after 25 cycles of no more than 0.038 percent.
3. Impact Strength: ASTM D256, 4 lbs/in (5.1 J) showing no visible damage on finish side.
4. Product Identification: Finish side identification and confirmation of meeting Class A interior finish requirements after installation and while in service, without labels.

2.2 INTERLOCKING PVC PANELS (Wash Bay)

A. General: 100% moisture resistant non-porous, seamless PVC wall panels with tongue and groove joint system and concealed fasteners designed for direct connection to wall studs.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Protek Systems, Inc. WCUL-400 (Basis of Design)
2. NUDO Products Inc.
3. Trusscore

D. Product Options:

1. Color: As selected by Architect from manufacturer's full range.
2. Surface Finish: Smooth
4. Nominal Thickness: 0.40 inch
5. Panel Size: Min. 16" wide x vertical length required for installation full height of space with no horizontal seams.

E. Performance Criteria:

1. Product Identification: Finish side identification and confirmation of meeting Class A interior finish requirements after installation and while in service, without labels.

2.2 ACCESSORIES

- A. Moldings, Trim and Caps: One-piece extruded polypropylene or PVC, configured to cover panel edges and corners.
  - 1. Color: As selected by Architect from manufacturer's full product range.
- B. Panel Adhesive: As recommended by panel manufacturer for the required substrates.
- C. Panel Sealant: Single-component, mildew-resistant silicone.
- D. Fasteners: All fasteners in wash bay to be stainless steel.

### 2.3 SOURCE QUALITY CONTROL

- A. Obtain fiberglass reinforced panels, moldings and other accessories from a single manufacturer.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. General: Comply with manufacturer's product data, including product technical bulletins, and installation instructions in product catalogs and product packaging.
- B. Verify that substrates previously installed under other sections are acceptable for product installation in accordance with FRP manufacturer's instructions.
  - 1. Examine substrate surfaces to determine that corners are plumb and straight, that surfaces are smooth, sound and uniform, that nails or screw fasteners are countersunk, and that joints and cracks are filled flush and smooth with adjoining surfaces.
  - 2. Do not begin panel installation until substrate surfaces are in satisfactory condition.

### 3.2 PREPARATION

- A. Clean substrates to remove substances that could impair bond of adhesive, including oil, grease, dirt, dust or other contamination.
- B. Condition panels by unpacking and placing in installation space no less than 24 hours before installation.
- C. Lay out paneling before beginning installation. Locate panel joints to provide equal panel widths at ends of walls and so that trimmed panels at corners are not less than 12 inches (300 mm) wide.

### 3.3 INSTALLATION

- A. General: Comply with panel manufacturer's Installation Guides for specific products and installation conditions.

- B. Cut and drill panels with carbide tipped saw blades or drill bits, or cut with snips.
- C. Install panels with manufacturer's recommended gap for panel field and corner joints.
  - 1. Pre-drill fastener holes in panels, 1/8 inch (3.2 mm) greater in diameter than fastener.
  - 2. Install panels in a full spread of adhesive. For trowel type and application of adhesive, follow adhesive manufacturer's recommendations.
- D. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.
- E. Sealant:
  - 1. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.
  - 2. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths.

### 3.5 CLEANING

- A. Remove temporary coverings and protection of adjacent work areas.
- B. Repair or replace any installed products that have been damaged.
- C. Clean installed panels in accordance with manufacturer's instructions prior to Owner's acceptance.
- D. Remove and lawfully dispose of construction debris from project site.

### 3.6 PROTECTION

- A. Protect installed product and finish surfaces from damage during construction.

END OF SECTION 097700

## SECTION 099123- INTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on scheduled interior substrates.
  1. Coating system materials, including sealers, primers, emulsions, enamels and other applied materials used as prime, intermediate and finish coats and the application of these materials.
  2. Touch-up and finish painting of shop primed metal fabrications, including metal doors and frames.
  
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect/Engineer will select from standard colors and finishes available.
  1. Painting includes field painting of exposed bare and covered pipes and ducts hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
  
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  1. Prefinished items include the following factory-finished components:
    - a. Plastic laminate finish countertops and cabinets and solid surfacing.
    - b. Acoustical ceiling panels.
    - c. Metal lockers.
    - d. Finished mechanical and electrical equipment.
    - e. Light fixtures.
    - f. Switchgear.
    - g. Distribution cabinets.
  2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Furred areas.
    - b. Ceiling plenums.
    - c. Pipe spaces.
    - d. Duct shafts.
  3. Finished metal surfaces include the following:
    - a. Anodized aluminum.
    - b. Stainless steel.
    - c. Chromium plate.
    - d. Copper.
    - e. Bronze and brass.
  4. Operating parts include moving parts of operating equipment and the following:

- a. Valve and damper operators.
  - b. Linkages.
  - c. Sensing devices.
  - d. Motor and fan shafts.
5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Requirements:
1. Division 07 for touch up of metal wall and roof panels and flashings in this Section
  2. Division 08 for factory priming metal doors and frames with primers specified in this Section.
  3. Division 09 Section "High-Performance Coatings".

## 1.2 DEFINITIONS

### A. Gloss Levels:

1. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
2. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
3. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
4. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
5. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
6. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
7. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

## 1.3 SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Product List: For each product indicated, include the following:
1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

## 1.4 QUALITY ASSURANCE

### A. Master Painters Institute (MPI) Standards:

1. Products: Comply with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.

- B. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.
- C. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened labeled packages and containers bearing manufacturer's name and label, and the following information.
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type.)
  - 3. Manufacturer's stock number and date of manufacture.
  - 4. Contents by volume, for pigment and vehicle constituents.
  - 5. Thinning instructions.
  - 6. Application instructions.
  - 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a single well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in a storage in a clean condition, free of foreign materials and residue.
- C. Maintain paint material storage space clean, non-hazardous and orderly. Place waste and soiled paint rags in tightly covered metal containers; safely dispose of at end of each working day. Take every precaution to avoid fire hazards and spontaneous combustion. Provide acceptable type of fire extinguisher immediately adjacent to paint storage area.
  - 1. Protect form freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

#### 1.6 PROJECT CONDITIONS

- A. Coordinate painting and finishing work with other trades to ensure adequate illumination, ventilation and dust-free environment during application and drying of paint and finish treatments.
- B. Comply with material manufacturer's recommended temperature and environmental limitations for painting and finishing applications.
  - 1. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).
  - 2. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.



1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.
- D. Provide necessary protection, enclosures and temporary heat and ventilation during inclement weather to permit proper application and drying of paint coatings and finishing treatments.
  1. Protect adjoining surfaces against damage or soiling.
- E. Maintain uniform interior building temperature of minimum 65 degrees F. and humidity of 20%-40% for 24 hours before, during and continuously after painting.
- F. Provide adequate ventilation for specified paint and finish treatment materials in spaces scheduled. Maintain for time periods recommended by material manufacturer to provide proper drying.
- G. Provide adequate illumination on surfaces to be finished. Maintain a minimum 15 foot candle lighting level.
- H. Maintain work in neat and orderly condition, promptly removing empty containers, wrappings, soiled rags, waste and rubbish from site.

#### 1.7 MAINTENANCE MATERIALS

- A. Furnish extra materials, from the same product run, 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.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with the requirements, equal products by one of the following manufacturers will be acceptable:
  - a. Benjamin Moore & Co.
  - b. PPG Architectural Finishes, Inc.
  - c. Sherwin-Williams Co. (Basis of Design)

#### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  1. Provide materials for use within each paint system that are 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, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors:
  1. As selected by Architect from manufacturer's full range.

### 2.3 PRIMERS/SEALERS

- A. Gypsum Board Primer Sealer, Latex, Interior: **MPI #50.**
  - 1. S-W: ProMar 200 Int Latex Primer B28W08200.
- B. Wood/Plywood Primer Sealer, Latex, Interior: **MPI #39.**
  - 1. S-W: PrepRite Multi-Purpose Latex Primer B51W08020.
- C. Ferrous Metal Primer, Alkyd, Quick Dry, for Metal: **MPI #76.**
  - 1. S-W: Kem Bond HS Metal Primer B50AZ0008
- D. Galvanized Metal Primer, Water Based: **MPI #134.**
  - 1. S-W: Galvite B50W00003.

### 2.4 UNDERCOAT MATERIALS

- A. Alkyd Interior Enamel Undercoat (Gloss Level 5): **MPI #46.**
  - 1. S-W: ProMar 200 Alkyd Semi-Gloss Enamel B34W08251

### 2.5 FINISH MATERIALS

- A. Egg-Shell, Latex, (Gloss Level 2): **MPI #44**
  - 1. S-W: ProMar 200 Interior Latex Eg-Shel B2012651
- B. Semi-Gloss, Latex: (Gloss Level 4). **MPI #43.**
  - 1. S-W: ProMar 200 Interior Latex Semi-Gloss B31W02651.
- C. Gloss, Alkyd; (Gloss Level 6). **MPI #48**
  - 1. S-W: ProMar 200 Interior Alkyd Gloss Enamel B35 Series.
- D. Deep-Color, Alkyd Resin Trim Paint: Deep-color, ready-mixed alkyd paint.
  - 1. S-W: SWP Exterior Gloss Finish A-2 Series.

### 2.6 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
  - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
  - 2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

## 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. Concrete: 12 percent.
  2. Wood: 15 percent.
  3. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- E. Notify the A/E about anticipated problems using the materials specified over substrates primed by others.
- F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- G. 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 Manual" applicable to substrates 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 re-prime substrate with compatible primers or apply tie coat to produce paint systems indicated.

2. Provide barrier coats over incompatible primers or remove and reprime. Notify A/E in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
- D. Gypsum board: Remove dust, dirt, loose and other foreign material. Fill hairline cracks, holes and other defects with filler compatible with finish treatment. Sand smooth.
  - E. Wood and Plywood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, free of all deleterious material. Sand surfaces exposed to view smooth and dust off.
    1. Scrape and clean small, dry, seasoned knots with a recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with filler compatible with finish treatment. Sand smooth when dried.
  - F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
  - G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
  - H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
  - I. Interior Steel Man Doors.
    1. Field prime and seal all steel doors as recommended by the door manufacturer prior to any finish painting.
    2. Finish paint bottom edges of all steel doors before they are hung.
  - J. Carefully mix and prepare paint materials according to manufacturer's directions.
    1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
    2. Stir material before application to produce a mixture of uniform density; stir in accordance with manufacturer's instructions during application. Do not stir surface film into material. Remove film and strain material before using as directed by manufacturer or A/E in the field.
    3. Use only thinners approved by the paint manufacturer and only within recommended limits.

### 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. Application Equipment
1. Brushes: Use brushes best suited for the material applied.
  2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
  3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required
- C. 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.
- D. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- E. 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.
- F. Painting Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed in equipment rooms, including but not limited to:
    - a. Uninsulated metal piping.
    - b. Uninsulated plastic piping.
    - c. Pipe hangers and supports.
    - d. Metal conduit.
    - e. Plastic conduit.
    - f. Tanks that do not have factory-applied final finishes.
    - g. Duct, equipment, and pipe insulation covering or other paintable jacket material.
    - h. Other items as directed by A/E
  2. Paint the following work where exposed in occupied spaces, including but not limited to:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - h. Other items as directed by A/E.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.
  4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  5. Finish exterior doors on tops, bottoms, and side edges same as exterior faces
  6. Sand lightly between each succeeding enamel coat
  7. Omit primer on metal surfaces that have been shop-primed and touch-up painted
- G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- H. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

### 3.4 FIELD QUALITY CONTROL

- A. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer
- B. 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

- 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.

### 3.6 PROTECTION

- A. 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 A/E, and leave in an undamaged condition.

- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.7 INTERIOR PAINTING SCHEDULE

- A. Coordinate Interior Painting work with Section 09 96 00 High-Performance Coatings.
  - 1. In general, High Performance Coatings are required throughout the interior Truck Storage and Wash Bay Areas.

#### INTERIOR OFFICE AREA

<u>LOCATION</u>	<u>COATING TYPE</u>
Office, Break Room	Latex
Metal doors & frames (Refer to 09 96 00)	Epoxy polyamide

- A. Gypsum Board Substrates:
  - 1. Egg-Shel latex finish: 2 finish coats over primer with total dry film thickness not less 4.4 mils.
- B. Ferrous Metal Substrates:
  - 1. Semi-Gloss latex finish: 2 finish coats over primer with total dry film thickness not less than 5.1 mils
- C. Zinc-Coated Metal Substrates:
  - 1. Gloss alkyd finish: 2 finish coats with total dry film thickness not less than 5.0 mils.
- D. Wood and Plywood Substrates, opaque painted finish:
  - 1. Semi-Gloss latex finish: 2 finish coats over primer with total dry film thickness not less than 4.2 mils
- E. Cotton or Canvas Insulation-Covering Substrates:
  - 1. Flat Latex Emulsion Size: Two coats. Add fungicidal agent to render fabric mildewproof.
  - 2. First and Second Coats: Interior, flat, latex-based paint

END OF SECTION 099123

## SECTION 099600- HIGH-PERFORMANCE COATINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes surface preparation and application of high-performance coating systems on scheduled exterior and interior substrates:
1. Coating system materials, including fillers, primers, sealers, intermediate coats and finish coats and other applied materials used as prime, intermediate and finish coats and the application of these materials.
  2. Touch-up and finish painting of shop primed structural steel framing, metal fabrications and metal doors and frames.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect/Engineer will select from standard colors and finishes available.
1. Painting includes field painting of exposed bare and covered pipes and ducts, hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
    - a. Plastic laminate finish countertops and cabinets and solid surfacing.
    - b. Acoustical ceiling panels.
    - c. Metal lockers.
    - d. Finished mechanical and electrical equipment.
    - e. Light fixtures.
    - f. Switchgear.
    - g. Distribution cabinets.
  2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Furred areas.
    - b. Ceiling plenums.
    - c. Pipe spaces.
    - d. Duct shafts.
  3. Finished metal surfaces include the following:
    - a. Anodized aluminum.
    - b. Stainless steel.
    - c. Chromium plate.
    - d. Copper.



- e. Bronze and brass.
  - 4. Operating parts include moving parts of operating equipment and the following:
    - a. Valve and damper operators.
    - b. Linkages.
    - c. Sensing devices.
    - d. Motor and fan shafts.
  - 5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Requirements:
- 1. Division 05 for shop priming of metal substrates with primers specified in this Section.
  - 2. Division 09 Section "Interior Painting" for interior painting.
  - 3. Division 23 for priming of HVAC with primers specified in this Section.

## 1.2 DEFINITIONS

- A. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- B. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

## 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Product List: For each product indicated, include the following:
  - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

## 1.4 QUALITY ASSURANCE

- A. Master Painters Institute (MPI) Standards:
  - 1. Products: Comply with MPI standards indicated and listed in "MPI Approved Products List."
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.
- B. Applicator Qualifications: Engage an experienced applicator who has completed high performance painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.

- C. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened labeled packages and containers bearing manufacturer's name and label, and the following information.
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type.)
  - 3. Manufacturer's stock number and date of manufacture.
  - 4. Contents by volume, for pigment and vehicle constituents.
  - 5. Thinning instructions.
  - 6. Application instructions.
  - 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a single well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in a storage in a clean condition, free of foreign materials and residue.
- C. Maintain paint material storage space clean, non-hazardous and orderly. Place waste and soiled paint rags in tightly covered metal containers; safely dispose of at end of each working day. Take every precaution to avoid fire hazards and spontaneous combustion. Provide acceptable type of fire extinguisher immediately adjacent to paint storage area.
  - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

#### 1.6 PROJECT CONDITIONS

- A. Coordinate painting and finishing work with other trades to ensure adequate illumination, ventilation and dust-free environment during application and drying of paint and finish treatments.
- B. Comply with material manufacturer's recommended temperature and environmental limitations for painting and finishing applications.
  - 1. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).
  - 2. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
  - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.
- D. Provide necessary protection, enclosures and temporary heat and ventilation during inclement weather to permit proper application and drying of paint coatings and finishing treatments.

1. Protect adjoining surfaces against damage or soiling.
  - E. Maintain uniform interior building temperature of minimum 65 degrees F. and humidity of 20%-40% for 24 hours before, during and continuously after painting.
  - F. Provide adequate ventilation for specified paint and finish treatment materials in spaces scheduled. Maintain for time periods recommended by material manufacturer to provide proper drying.
  - G. Provide adequate illumination on surfaces to be finished. Maintain a minimum 15 foot candle lighting level.
  - H. Maintain work in neat and orderly condition, promptly removing empty containers, wrappings, soiled rags, waste and rubbish from site.
- 1.7 MAINTENANCE 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. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements provide products by one of the scheduled manufacturers.
- B. Interior and Exterior Primers/Sealers, Intermediate Coats, and Finish Coats: Subject to compliance with the requirements, equal products by one of the following manufacturers will be acceptable:
  1. Sherwin Williams Co.
  2. AkzoNobel Paints; Devoe High Performance Coatings, [www.devoecoatings.com](http://www.devoecoatings.com).
  3. PPG Architectural Coatings, Inc, [www.pittsburghpaints.com](http://www.pittsburghpaints.com).
- C. Wash Bay Metal Primer, Intermediate Coat and Finish Coat: Subject to compliance with the requirements, equal products by one of the following manufacturers will be acceptable:
  1. Shield Products high performance Fluoropolymer products, [www.shieldproducts.com](http://www.shieldproducts.com)
  2. Sherwin Williams, Fluoropolymer Coatings, [www.sherwin-williams.com](http://www.sherwin-williams.com)
  3. PPG Industries, Inc. Industrial and Fluoropolymer Coatings, [www.ppg.com](http://www.ppg.com).
  4. Keeler & Long, PPG Industries, Fluoropolymer Coatings, [www.ppg.com](http://www.ppg.com).

### 2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
  1. Provide materials for use within each coating system that are 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 coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Wherever possible, provide products of same manufacturer for each coat in a coating system.

B. Colors:

1. As selected by Architect from manufacturer's full range.

2.3 METAL PRIMERS/SEALERS

A. Metal Primers Under Pigmented, Aliphatic, Polyurethane Enamel: MPI #79

1. Sherwin-Williams; Macropoxy 646-100 Fast Cure Epoxy Mill White: B58W00620.

B. Metal Primers Under Two-Component, High-Performance, Polyamide-Epoxy Coatings: MPI #101

1. Sherwin-Williams; Macropoxy 646-100 Fast Cure Epoxy Mill White: B58W00620.

C. WASH BAY Metal Primers: MPI # 20

1. Shield Products, SKU40003, Shield Metal Cleaner.

D. Metal Duct Metal Primers:

1. Apply 1 coat PPG Seal Grip 100% Acrylic Primer/Sealer (17-921) @ 4.0 mils, 1.5 mils Dry Film Thickness

2.4 INTERMEDIATE COAT MATERIALS

A. Intermediate Coat Under Pigmented, Aliphatic, Polyurethane Enamel: MPI #72

1. Provide manufacturer's recommended Factory-Formulated, Intermediate Coat Materials that are compatible with the substrate, primers or base coat materials, and the finish materials indicated:
2. Sherwin-Williams; Hi Solids Polyurethane 100 Gloss (part A) Extra White Part A: B65W00625.

B. WASH BAY - Metal Intermediate Coat: MPI #108

1. Provide manufacturer's recommended Factory-Formulated, Intermediate Coat Materials that are compatible with the substrate, primers or base coat materials, and the finish materials indicated:
2. Sherwin-Williams; Macropoxy 646-100 Fast Cure Epoxy Mill White: B58W00620.

C. WASH BAY - Intermediate Coat: MPI #108

1. Apply 1 coat PPG Amerilock 2" High Solids, Surface Tolerant Epoxy, @ 6.0-8.0 mils Dry Film Thickness. Allow overnight dry.

## 2.5 EXTERIOR FINISH-COAT MATERIALS

### A. Exterior Finish-Coat Materials: Pigmented, Aliphatic, Polyurethane Enamel: MPI #72.

1. Provide manufacturer's recommended Factory-Formulated, Finish Coat Materials that are compatible with the substrate, primers or base coat materials, and the finish materials indicated:
2. Sherwin-Williams; Hi Solids Polyurethane 100 Gloss (part A) Extra White Part A: B65W00625.

## 2.6 INTERIOR FINISH-COAT MATERIALS HIGH PERFORMANCE, POLYAMIDE-EPOXY COATING:

### A. High Build Gloss Epoxy: MPI #98

1. Provide manufacturer's recommended Factory-Formulated, Finish Coat Materials that are compatible with the substrate, primers or base coat materials, and the finish materials indicated:
2. Sherwin-Williams; Pro Industrial High Performance Epoxy Pure White /Tint Base Part A: B67W00201.

### B. WASH BAY – Fluoropolymer Gloss:

1. Provide manufacturer's recommended Factory-Formulated, Finish Coat Materials that are compatible with the substrate, primers or base coat materials, and the finish materials indicated:
2. Sherwin-Williams; FluoroKem Fluoropolymer Urethane Part A Extra White: B65W00550

### C. WASH BAY – Gloss Epoxy:

1. Apply 1 coat PPG “Amerlock 2” High Solids, Surface Tolerant Epoxy, @ 6.0-8.0 mils Dry Film Thickness. Allow 72 hours for full chemical cure (based on 70 degrees F)

### D. Aluminum Gloss Alkyd Enamel: MPI #81

1. Provide manufacturer's recommended Factory-Formulated, Finish Coat Materials that are compatible with the substrate, and the finish materials indicated:
2. Sherwin-Williams; Pro-Industrial Industrial Enamel 100 Pure White: B54WZ0211.

### E. Interior Galvanized Metal Duct Gloss Epoxy

1. Apply 2 coats PPG “Pittglaze WB1” Epoxy (16-510), @ 4.0 mils, 1.5 mils Dry Film Thickness.

## 2.7 SOURCE QUALITY CONTROL

### A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

### 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.
  1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
    - a. Concrete: 12 percent.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

#### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates 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.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat to produce coating systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
  1. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
- H. Surface Preparation for Interior Galvanized Metal Ducts: Be sure surface is free of dirt, oils, passivators or other surface contaminants. Apply a test patch; allow to dry for 72 hours and conduct an adhesion test to insure compatibility.
- I. Exterior Steel Man Doors.
  - 1. Field prime and seal all steel doors as recommended by the door manufacturer prior to any finish painting.
  - 2. Finish paint bottom edges of all steel doors before they are hung.
- J. Aluminum: Remove oil, grease, dirt, oxide and other foreign materials by wiping, etching, or scrubbing with brushes, or degrease and clean in accordance with SSPC-SP1-63 Solvent Cleaning. Let dry and then immediately paint.

### 3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
  - 1. Use applicators and techniques suited for coating and substrate indicated.
  - 2. Application Equipment
    - a. Brushes: Use brushes best suited for the material applied.
    - b. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
    - c. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
  - 3. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 4. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 5. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.
- E. Mechanical items to be painted include, but are not limited to, the following:
  - 1. Piping, pipe hangers, and supports.
  - 2. Heat exchangers, make up air units.
  - 3. Insulation.
  - 4. Supports.
  - 5. Motors and mechanical equipment.
  - 6. Accessory items.
- B. Electrical items to be painted include, but are not limited to, the following:
  - 1. Conduit, conduit hangers, supports and fittings.
  - 2. Telephone/Electric mounting backboard plywood.

### 3.4 FIELD QUALITY CONTROL

- A. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer
- B. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
  - 1. Contractor shall touch up and restore coated surfaces damaged by testing.
  - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating 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 coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect/Engineer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

### 3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

<u>EXTERIOR LOCATION</u>	<u>COATING TYPE</u>
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Pedestrian doors including top and bottom and frames	Epoxy polyamide gloss
Wall mounted exhaust fans	Aliphatic acrylic-urethane gloss
Gas piping & meter, electric conduit & meter	Aliphatic acrylic-urethane gloss

A. Steel and Galvanized Metal Substrates:

1. High-Performance Polyamide-Epoxy Coating System: Provide two finish coats of two-component, polyamide-epoxy coating, gloss finish, over metal prime with dry film thickness per coat not less than recommended by manufacturer.
2. High Performance Aliphatic Acrylic-Urethane Coating System: Provide two finish coats over metal primer with dry film thickness per coat not less than recommended by manufacturer.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Coordinate Interior High Performance Coating work with Section 099123 Interior Painting.

1. In general, High Performance Coatings are required in the interior of all truck storage and wash bay areas.
2. GWB Ceiling in Restroom to receive High Performance Coatings.
3. Interior Steel and Galvanized Metal Substrates:
  - a. High Performance, Polyamide Epoxy Coating System.
4. Wash Bay; All Painted Surfaces.
  - a. High Performance, High Solids, Fluoropolymer Coating System.

INTERIOR COATINGS

LOCATION	COATING TYPE
Conduit, pipe, pipe hangers	Epoxy polyamide
Support rods, angles and supports below roof deck liner	Epoxy polyamide
Heating exchangers and components if not prefinished	High temperature aluminum

Ventilation equipment, louvers, grilles (below roof level)	Epoxy polyamide
ALL exposed Ducts and motors in garage Primed as part of HVAC scope of work (23 31 13.01)	Epoxy gloss
Pedestrian doors, frames. Overhead door tube steel frames.	Epoxy polyamide gloss
Vents, louvers and equipment.	Same as adjacent major surfaces - see specification & review with Architect/Engineer.
Wash bay (concrete wainscot/all painted surfaces).	Epoxy gloss
Restroom ceiling.	Epoxy polyamide semi-gloss

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B. Concrete Substrates:

1. High-Performance Polyamide-Epoxy Coating System: Provide two finish coats with dry film thickness per coat not less than recommended by manufacturer.

C. Steel and Galvanized Metal Substrates:

1. High-Performance Polyamide-Epoxy Coating System: Provide two finish coats of two-component, polyamide-epoxy coating, gloss finish, over metal prime with dry film thickness per coat not less than recommended by manufacturer.

D. Wash Bay Substrates:

1. Concrete: High-Performance Epoxy Coating: Provide primer and two finish coats with dry film thickness per coat not less than recommended by manufacturer.
2. Masonry: High-Performance Epoxy Coating System: Provide two finish coats with dry film thickness per coat not less than recommended by manufacturer over concrete masonry epoxy block filler.
3. Steel and Galvanized Metal High-Performance Fluoropolymer Coating System: Provide two finish coats of two-component, fluoropolymer, gloss finish, over metal prime with dry film thickness per coat not less than recommended by manufacturer.

E. Aluminum Substrates:

1. Gloss Alkyd Enamel: Provide two finish coats, gloss finish, over metal prime with dry film thickness per coat not less than recommended by manufacturer.

ODOT - EATON OUTPOST  
DOT-200023

Jerome M. Scott Architects, Inc.

END OF SECTION 099600

## SECTION 101100 – VISUAL DISPLAY SURFACES

### 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. Markerboards.
  - 2. Tackboards.
- B. Related Sections:
  - 1. Division 06 Section "Rough Carpentry".

#### 1.3 DEFINITIONS

- A. Tackboard: Framed or unframed, tackable, visual display board assembly.
- B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.
- C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show locations of panel joints.
  - 2. Show locations of special-purpose graphics for visual display surfaces.
  - 3. Include sections of typical trim members.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.
- B. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 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.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-built visual display surfaces completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.
- B. Store visual display surfaces vertically with packing materials between each unit.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.
  - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

## 1.10 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Surfaces lose original writing and erasing qualities.
    - b. Surfaces exhibit crazing, cracking, or flaking.
  - 2. Warranty Period: 50 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Porcelain-Enamel Face Sheet: ASTM A 424, enameling-grade steel, uncoated thickness indicated; with exposed face and edges coated with primer, 1.7-to-2.5-mil- (0.043-to-0.064-mm-) thick ground coat, and color cover coat; and with concealed face coated with primer and 1.7-to-2.5-mil- (0.043-to-0.064-mm-) thick ground coat.
- B. Melamine: Thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- C. High-Pressure Plastic Laminate: NEMA LD 3.
- D. Natural Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish with surface-burning characteristics indicated.
- E. Hardboard: ANSI A135.4, tempered.
- F. Particleboard: ANSI A208.1, Grade M-1
- G. Adhesives: Manufacturer's standard product.

### 2.2 MARKERBOARD ASSEMBLIES

- A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch- (0.53-mm-) thick, porcelain-enamel face sheet with high-gloss finish.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Claridge Products and Equipment, Inc.
    - b. Egan Visual Inc.
    - c. Ghent Manufacturing, Inc.
    - d. Marsh Industries, Inc.; Visual Products Group.
    - e. Educational Equipment; K-Pro

2. Fiberboard Core: 3/8 inch (9.5 mm) thick; with 0.015-inch- (0.38-mm-) thick, aluminum sheet backing.
3. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.

### 2.3 TACKBOARD ASSEMBLIES

- A. Vinyl-Fabric-Faced Tackboards: Vinyl fabric factory laminated to 3/8 inch thick fiberboard backing.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Claridge Products and Equipment, Inc.
    - b. Egan Visual Inc.
    - c. EverProducts by Glenroy Inc.
    - d. Ghent Manufacturing, Inc.
    - e. Marsh Industries, Inc.; Visual Products Group.
    - f. Educational Equipment; K-Pro

### 2.4 MARKERBOARD AND TACKBOARD ACCESSORIES

- A. Aluminum Frames fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; of size and shape indicated.
  1. Factory-Applied Trim: Manufacturer's standard.
- B. Marker tray: Manufacturer's standard, continuous.
  1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
- C. Provide 2 sets of markers and erasers for each marker board.

### 2.5 FABRICATION

- A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.
- B. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.
  1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

### 2.6 GENERAL FINISH REQUIREMENTS

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

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motor-operated, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display surfaces.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

### 3.3 INSTALLATION, GENERAL

- A. General: Install visual display surfaces in locations indicated on Drawings (coordinate exact location with architect in field) and at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
  - 1. Mounting Height – Mount top of visual display surfaces 7'-0" above finished floor.



3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

- A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches (400 mm) o.c. Secure both top and bottom of boards to walls.
  - 1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches (610 mm) o.c.
    - a. Attach marker trays to boards with fasteners at not more than 12 inches (300 mm) o.c.

3.5 CLEANING AND PROTECTION

- A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 10 11 00

## SECTION 101423 - PANEL SIGNAGE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification signs.
  - 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
  - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples: For each exposed product and for each color and texture specified.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

### 2.2 PANEL SIGNS

- A. Room-Identification Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

- 1. Manufacturers:

- a. Ace Sign System, Inc.
- b. Allen Industries, Inc.
- c. APCO Graphics, Inc.
- d. ASI Sign Systems
- e. Best Sign Systems
- f. Clarke Systems
- g. Columbus Graphics
- h. InPro Corporation
- i. Vista Systems

- 2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.

- a. Composite-Sheet Thickness: 0.125 inch.
- b. Surface-Applied Graphics: Applied vinyl film
- c. Subsurface Graphics: Reverse halftone or dot-screen image
- d. Color(s): As selected by Architect from manufacturer's full range.

- 3. Sign-Panel Perimeter: Finish edges smooth.

- a. Edge Condition at Vertical Edges and at Horizontal Edges - Square cut.
- b. Corner Condition in Elevation: As indicated on drawings.

- 4. Mounting: Manufacturer's standard method for substrates indicated.

### 2.3 SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.

## 2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
  - 1. Use concealed fasteners and anchors unless indicated to be exposed.
  - 2. For exterior exposure, furnish nonferrous-metal or hot-dip galvanized devices unless otherwise indicated.
  - 3. Exposed Metal-Fastener Components, General:
    - a. Fabricated from same basic metal and finish of fastened sign unless otherwise indicated.
  - 4. Sign Mounting Fasteners:
    - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
    - b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

## 2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
  - 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  - 2. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
  - 3. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  2. Install signs so they do not protrude or obstruct according to the accessibility standard.
  3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Mounting Methods:
1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
  2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
  3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
  4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

END OF SECTION 101423

## SECTION 102213 - WIRE MESH PARTITIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Standard-duty wire mesh partitions.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For units with factory-applied color finishes.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. Subject to compliance provide products from one of the following:

1. American Woven Wire Corporation
  - a. Corona CA (Ph.) 909-884-9990
  - b. [www.americanwirecorp.com](http://www.americanwirecorp.com)
2. Indiana Wire Products
  - a. 915 North Ireland St., Greensburg, IN 47240 (PH.)800-451-0406
  - b. [www.indianawireproducts.com](http://www.indianawireproducts.com)
3. Miller Wire Works, Inc.
  - a. 7429 Georgia Rd., Birmingham AL 35212, (Ph.) 800-315-6374
  - b. [www.millerwireworks.com](http://www.millerwireworks.com)
4. *Standard Wire & Steel*
  - a. *16255 Vincennes Ave., South Holland, IL 60473*
  - b. [www.standardwiresteel.com](http://www.standardwiresteel.com)

#### 2.2 MATERIALS

A. Steel Wire: ASTM A 510.

B. Steel Plates, Channels, Angles, and Bars: ASTM A 36.

C. Steel Sheet: Cold-rolled steel sheet, ASTM A 1008, Commercial Steel (CS), Type B.

- D. Steel Pipe: ASTM A 53, Schedule 40, unless another weight is indicated or required by structural loads.
- E. Steel Tubing: ASTM A 500, cold-formed structural-steel tubing or ASTM A 513, Type 5, mandrel-drawn mechanical tubing.
- F. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.

### 2.3 STANDARD-DUTY WIRE MESH PARTITIONS

- A. Partition Height: 8'-0"
- B. Mesh: 0.135-inch diameter, intermediate-crimp steel wire woven into 1-1/2-inch diamond mesh.
- C. Vertical Panel Framing: 1-1/4-by-5/8-by-0.080-inch cold-rolled, C-shaped steel channels with holes for 1/4-inch diameter bolts not more than 12 inches o.c.
- D. Horizontal Panel Framing: 1-by-1/2-by-1/8-inch cold-rolled steel channels.
- E. Horizontal Panel Stiffeners: Two cold-rolled steel channels, 3/4 by 3/8 by 1/8 inch, bolted or riveted toe to toe through mesh or one 1-by-1/2-by-1/8-inch cold-rolled steel channel with wire mesh woven through channel.
- F. Top Capping Bars: 2-1/4-by-1-inch cold-rolled steel channels.
- G. Posts for 90-Degree Corners: 1-1/4-by-1-1/4-by-1/8-inch steel angles or square tubes with holes for 1/4-inch diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.
- H. Posts for Other-Than-90-Degree Corners: Steel pipe or tubing with holes for 1/4-inch diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.
  - 1. Partitions up to 12 Feet High: 1-1/4-inch OD by 1/8 inch.
- I. Adjustable Corner Posts: Two 1-1/4-by-5/8-by-0.080-inch cold-rolled, C-shaped steel channels connected by steel hinges at 36 inches o.c., with holes for 1/4-inch diameter bolts aligning with bolt holes in vertical framing.
- J. Line Posts: 3-inch-by-4.1-lb or 3-1/2-by-1-1/4-by-0.127-inch steel channels; with 1/4-inch steel base plates.
- K. Three-Way Intersection Posts: 1-1/4-by-1-1/4-by-1/8-inch steel tubes or channels, with holes for 1/4-inch diameter bolts aligned for bolting to adjacent panels.
- L. Four-Way Intersection Posts: 1-1/4-by-1-1/4-by-1/8-inch steel tubes, with holes for 1/4-inch-diameter bolts aligned for bolting to adjacent panels.
- M. Floor Shoes: Metal, not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.

- N. Sliding Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm) steel channels, banded with 1-1/2-by-1/8-inch (38-by-3.2-mm) flat steel bar cover plates on four sides.
  - 1. Opening Height: Minimum 7'-0"
  - 2. Hardware: Two, four-wheel roller-bearing carriers, box track, and bottom guide channel for each door.
  - 3. Padlock Lug: Mortised into door framing and enclosed with steel cover.
  - 4. Cylinder Lock: Mortise type with interchangeable core cylinder as specified in Section 087100 "Door Hardware"; operated by key outside and recessed turn knob inside.
- O. Accessories:
  - 1. Adjustable Filler Panels: 0.060-inch thick steel sheet, capable of filling openings from 2 to 12 inches.
- P. Finish: Powder-coated finish unless otherwise indicated.
  - 1. Color: As selected by Architect from manufacturer's full range.

## 2.4 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
  - 1. Fabricate wire mesh items to be readily disassembled.
  - 2. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.
- B. Standard Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
  - 1. Mesh: Weld mesh to framing.
  - 2. Framing: Fabricate framing with mortise and tenon corner construction.
    - a. Provide horizontal stiffeners as indicated or, if not indicated, as recommended by wire mesh partition manufacturer for panel height. Weld horizontal stiffeners to vertical framing.
  - 3. Fabricate wire mesh partitions with 3 to 4 inches (75 to 100 mm) of clear space between finished floor and bottom horizontal framing.
  - 4. Fabricate wire mesh partitions with bottom horizontal framing flush with finished floor.
  - 5. Doors: Align bottom of door with bottom of adjacent panels.
    - a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.
  - 6. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing to install hardware.



## 2.5 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.
- B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of wire mesh units unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- D. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on powder-coat finish, suitable for use indicated, with a minimum dry film thickness of 2 mils (0.05 mm).

## PART 3 - EXECUTION

### 3.1 WIRE MESH PARTITIONS ERECTION

- A. Anchor wire mesh partitions to floor with 3/8-inch- (9.5-mm-) diameter postinstalled expansion anchors at 12 inches (300 mm) o.c. through anchor clips located at each post and corner. Shim anchor clips to achieve level and plumb installation.
- B. Anchor wire mesh partitions to floor with 3/8-inch- (9.5-mm-) diameter postinstalled expansion anchors at 12 inches (305 mm) o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
- C. Anchor wire mesh partitions to walls at 12 inches (305 mm) o.c. through back corner panel framing.
- D. Secure top capping bars to top framing channels with 1/4-inch- (6-mm-) diameter "U" bolts spaced not more than 28 inches (700 mm) o.c.
- E. Provide line posts at locations indicated.
- F. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer for stability, extending and fastening members to supporting structure.
- G. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.
- H. Install doors complete with door hardware.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust doors and gates to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.

- B. 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.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 102213



## SECTION 102800- TOILET, BATH, AND LAUNDRY ACCESSORIES

### 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. Public-use washroom accessories.
  - 2. Custodial accessories.
- B. Owner-Furnished Material: Contractor Installed.
  - 1. Soap Dispensers.
  - 2. Toilet Paper Dispensers.
  - 3. Paper Towel Dispensers.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
  - 5. Manufacturer's warranty.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

## 1.7 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry in order to prevent delaying the Work.

## 1.8 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

## 2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
1. Bobrick Washroom Equipment, Inc. A & J Washroom Accessories, Inc.
  2. A & J Washroom Accessories, Inc
  3. Bradley Corporation.
- B. Toilet Tissue (Roll) Dispenser
1. Owner furnished; Contractor Installed.
- C. Paper Towel (Folded) Dispenser:
1. Owner furnished; Contractor Installed
- D. Waste Receptacle :
1. Basis-of-Design: Bobrick B-43644
  2. Mounting: Recessed.
  3. Material and Finish: Stainless steel, No.4 finish (satin)
  4. Liner: Reusable, vinyl waste-receptacle liner.
  5. Lockset: Non-locking
- E. Liquid-Soap Dispenser
1. Owner furnished; Contractor Installed
- F. Grab Bar
1. Basis-of-Design: Bobrick B-6806 x 36; Bobrick B-6806 x 42; Bobrick B-6806 x 18.
  2. Mounting: Flanges with concealed fasteners.
  3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
    - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
  4. Outside Diameter: 1-1/2 inches (32 mm).
  5. Configuration and Length: As indicated on Drawings: Straight, 18 inches (455mm), Straight, 36 inches (914 mm) long, and Straight 42" ( 1066 mm)
- G. Sanitary Napkin / Tampon Disposal Unit:
1. Basis-of-Design: Bobrick B-270
  2. Mounting: Surface mounted.
  3. Door or Cover: Self-closing, disposal-opening cover.
  4. Receptacle: Removable.
  5. Material and Finish: Stainless steel, No. 4 finish (satin).
- H. Framed Mirror
1. Basis of Design: Bobrick B-290
  2. Frame: Stainless-steel angle 0.05 inch thick.
    - a. Corners: Welded and ground smooth.
  3. Hangers: Produce rigid, tamper proof and theft resistant installation using one piece, galvanized steel wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws, bolts, or fasteners.

4. Size: as indicated in drawings.

I. Coat Hook

1. Basis of Design: Bobrick B-2116
2. Mounting: Concealed
3. Material and Finish: Satin nickel-plated

2.3 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.
3. HD Supply

2.4 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.

B. Mop and Broom Holder:

1. Basis-of-Design: Bobrick B-224
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Three.
5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 satin.
  - a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.
  - b. Rod: Approximately 1/4-inch- (6-mm-) diameter stainless steel.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800





## SECTION 104413 - FIRE PROTECTION CABINETS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes fire-protection cabinets for portable fire extinguishers.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fire-protection cabinets.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

### PART 2 - PRODUCTS

#### 2.1 FIRE-PROTECTION CABINET - FEC

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. J. L. Industries
  - 2. Kidde Commercial Division
  - 3. Larsens
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Stainless-steel sheet.
- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
  - 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.

- E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim. Provide where walls are of insufficient depth for semirecessed cabinet installation, and as indicated on the drawings.
- F. Cabinet Trim Material: Same material and finish as door.
- G. Door Material: Stainless-steel sheet.
- H. Door Style: Fully glazed,
- I. Door Glazing: Tempered float glass (clear)
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide manufacturer's standard door pull and non-keyed latch.
- K. Accessories:
  - 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
    - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER"
      - 1) Location: Applied to cabinet door
      - 2) Application Process: Pressure-sensitive vinyl letters.
      - 3) Lettering Color: Red.
      - 4) Orientation: Vertical.
- L. Materials:
  - 1. Stainless Steel: ASTM A 666, Type 304.
    - a. Finish: No. 4 directional satin finish.
  - 2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear)

## 2.2 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.
- B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Identification: Apply vinyl lettering at locations indicated.
- E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION 104413



## SECTION 104416 - FIRE EXTINGUISHERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Six years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

## 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
  - 1. J. L. Larsens
  - 2. Kidde Commercial Division
  - 3. Larsens
- B. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- C. Multipurpose Dry-Chemical Type: UL-rated 5 lb. nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.
- D. Multipurpose Dry-Chemical Type: UL-rated 10 lb. nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

## 2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
  - 1. J. L. Industries
  - 2. Kidde Commercial Division
  - 3. Larsens
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
  - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
    - a. Orientation: Vertical.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416





## SECTION 105113 - METAL LOCKERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Standard metal lockers.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.
- B. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show locker trim and accessories.
  - 2. Include locker identification system and numbering sequence.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For metal lockers, in manufacturer's standard sizes.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

#### 1.6 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. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
  - a. Locks.
  - b. Identification plates.
  - c. Hooks.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain metal lockers and accessories from single source from single manufacturer.
- C. Regulatory Requirements: Where metal lockers are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities".

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

#### 1.9 COORDINATION

- A. Coordinate sizes and locations of bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Faulty operation of latches and other door hardware.
  2. Damage from deliberate destruction and vandalism is excluded.
  3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.
- C. Expanded Metal: ASTM F 1267, Type II (flattened), Class I, 3/4-inch steel mesh, with at least 70 percent open area.
- D. Stainless-Steel Sheet: ASTM A 666, Type 304.
- E. Plastic Laminate: NEMA LD 3, Grade HGP.
- F. Extruded Aluminum: ASTM B 221, alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.
- G. Steel Tube: ASTM A 500, cold rolled.
- H. Particleboard: ANSI A208.1, Grade M-2.
- I. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- J. Anchors: Material, type, and size required for secure anchorage to each substrate.
  - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and all other locations for corrosion resistance.
  - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

### 2.2 STANDARD METAL LOCKERS

- A. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Art Metal Products; Standard K.D. Lockers.
  - 2. Lyon Workspace Products, LLC; Standard Lockers.
  - 3. Penco Products – Metal Lockers
  - 4. Republic Storage Systems Company; Standard Lockers.
  - 5. Shanahan's Manufacturing Limited; Deluxe Series Lockers.
  - 6. Tensco Corp.; Tensco Lockers.
- B. Locker Arrangement: Single tier.
  - 1. Garage lockers 24”w x 21”d x 72” high with legs.
- C. Material: Cold-rolled steel sheet.

- D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet as follows:
1. Tops, Bottoms, and Intermediate Dividers: 0.024-inch (0.61-mm) nominal thickness, with single bend at sides.
  2. Backs and Sides: 0.024-inch (0.61-mm) nominal thickness, with full-height, double-flanged connections.
  3. Shelves: 0.024-inch (0.61-mm) nominal thickness, with double bend at front and single bend at sides and back.
- E. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.
1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
  2. Frame Vents: Fabricate face frames with vents.
- F. Doors: One piece; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
1. Doors less than 12 inches (305 mm) wide may be fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
  2. Doors for box lockers less than 15 inches (381 mm) wide may be fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
  3. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
  4. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet; welded to inner face of doors.
  5. Door Style: Vented panel as follows:
    - a. Louvered Vents: No fewer than six louver openings at top and bottom for single-tier lockers.
- G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; self-closing.
1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches (51 mm) high. Provide no fewer than three hinges for each door more than 42 inches (1067 mm) high.
  2. Continuous Hinges: Manufacturer's standard, steel, full height.
- H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry and vandal resistant.
1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and prelocking.

- a. Latch Hooks: Equip doors 48 inches (1219 mm) and higher with three latch hooks fabricated from 0.105-inch (2.66-mm) nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
  - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated with vinyl to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- I. Combination Padlocks: Provided by Owner.
- J. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:
1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
- K. Accessories:
1. Legs: 6 inches (152 mm) high; formed by extending vertical frame members, or fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet; welded to bottom of locker.
    - a. Closed Front and End Bases: Fabricated from 0.036-inch (0.91-mm) nominal-thickness steel sheet.
  2. Continuous Sloping Tops: Fabricated from 0.036-inch (0.91-mm) nominal-thickness steel sheet.
    - a. Closures: Vertical-end type.
    - b. Sloping-top corner fillers, mitered.
  3. Filler Panels: Fabricated from 0.036-inch (0.91-mm) nominal-thickness steel sheet.
  4. Boxed End Panels: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet.
  5. Finished End Panels: Fabricated from 0.024-inch (0.61-mm) nominal-thickness steel sheet.
  6. Center Dividers: Fabricated from 0.024-inch (0.61-mm) nominal-thickness steel sheet.
- L. Finish: Baked enamel.
1. Color(s): As selected by A/E from manufacturer's full range.

## 2.3 FABRICATION

- A. Fabricate metal lockers square, rigid, and without warp and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
  2. Provide fasteners, filler plates, supports, clips, and closures for complete installation.

- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site.
- D. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.
- E. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
  - 1. Sloping-top corner fillers, mitered.
- F. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
- G. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
  - 1. Provide one-piece panels for double-row (back-to-back) locker ends.
- H. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

## 2.4 STEEL SHEET FINISHES

- A. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.
- B. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install level, plumb, and true. Shim to stand level, using concealed shims.
  - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking to prevent metal distortion.
  - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
- B. Knocked-Down Metal Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.
- C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
  - 1. Attach hooks with at least two fasteners.
  - 2. Attach recess trim to recessed metal lockers with concealed clips.
  - 3. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
  - 4. Attach sloping-top units to metal lockers, with closures at exposed ends.
  - 5. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
  - 6. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

### 3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.
- B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113





## SECTION 111100- VEHICLE SERVICE EQUIPMENT

### PART 1 GENERAL

#### 1.1 DESCRIPTION OF WORK:

- A. Types of garage equipment work in this section includes:
  - 1. Air Reel Systems
  - 2. Trench Drains and Catch Basins
  - 3. Water Reel Systems

#### 1.2 SUBMITTALS:

- A. Product Data: Submit for materials, fabrication and installation for each type of equipment specified, including catalog cuts of anchors, hardware, fastenings and accessories. Submit manufacturer's product data showing capacities and capabilities and instructions, operating and maintenance instructions for each product.
- B. Shop Drawings: Submit shop drawings for each type of equipment not explained in manufacturer's product and data sheets, showing layout, sizes, heights, profiles, clearances, recesses, anchorage's and location of services by other trades including plumbing and electrical where required.
- C. Color Samples: Submit two sets of manufacturer's available standard color samples for all exposed surfaces to be selected by Architect/Engineer.
- D. Service and Maintenance Manuals: Submit complete details of installation, complete repair parts list showing illustrations of individual components, name and address of dealer where parts and service can be obtained.

#### 1.3 JOB CONDITIONS:

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible installation of work to permit adequate protection from corrosion due to vapor, fluid or dissimilar materials. Contractor shall make all field measurements needed prior to fabrication and shall be responsible for all quantities shown on drawings.

#### 1.4 WARRANTY / GUARANTEE:

- A. The manufacturer shall guarantee the work and installation against and defect in material and workmanship for a period of (1) year after final acceptance of work, unless noted otherwise in this section. Contractor shall replace any defective work covered by this guarantee immediately when notified at no expense to the owner.

### PART 2 – PRODUCTS

#### 2.1 SERVICE REELS

- A. Manufacturers:
  - 1. Air reels are based on Graco Inc. Subject to compliance with the requirements, products by one of the following manufacturers will be acceptable:

- a. Graco Inc.
- b. ARO
- c. Lincoln-Pentair
- d. Balcrank

- 2. The contractor to furnish materials and equipment necessary to install, test and make ready for operation a fluid dispense system as specified herein.
- 3. All like components within a fluid system such as pump and pump controls, reels, hoses, valves, connectors, volume meters, etc., shall be the products of a single manufacturer.

B. Materials:

1. OVERHEAD REEL SYSTEM

Graco SD Series heavy duty reels shall be spring powered and self-retracting with a minimum of four replaceable roller guides incorporated in a sliding hose outlet to ensure an even rewind of hose onto the reel. Reel to incorporate structurally engineered frame made from high strength steel. Reel to include long lasting rewind spring with sealed bearing and open swivel ports for high fluid flow and minimal pressure loss. Reels shall carry a minimum three year parts and labor warranty. Colors to be selected by Architect from full range of Manufacturer's standard colors.

a. SD Series Heavy Duty Air Reel Graco #HPL56X

Hose length:	65' x 3/8" ID
Reel outlet:	3/8"
Reel inlet:	1/2" npsm
Pressure rating:	300 psi

The following accessories are to be installed at each reel:

Hose Inlet Kit	Graco #218549
Air Shutoff Valve	Graco #110225
Reel Enclosure	Graco #24A218
Air Coupler	Graco #110199
Nipple	Graco #110196

2. MISCELLANEOUS EQUIPMENT

End Panel Kit (1 kit at each reel)	Graco #24A951
Reel Mounting Channels	Graco #203525

2.2 TRENCH DRAINS AND CATCH BASINS:

- A. Provide trench drains and catch basins at indicated locations.
- B. Manufacturers:

1. Trench Drains and Catch Basins are based on ACO Polymer Products Inc. Subject to compliance with the requirements, products by one of the following manufacturers will be acceptable:
  - a. ACO Polymer Products, Inc.
  - b. ABT Inc.
  - c. Polycast Hubbel Incorporated
- C. Materials:
  1. General: Subject to compliance with requirements, provide polymer concrete insert trench drain assemblies and indicated catch basin assemblies (sand/sump boxes), with covers, fasteners, accessories, stiffeners and other items required for complete cast-in-place installation. All trench drains, catch basins, sumps and drain covers shall be heavy duty capable of supporting class "E" loads (trucks and fork lifts.) All drain covers and frames shall be cast iron.
  2. Models:
    - a. Trench Drain (12" wide) Assembly: S300K
    - b. Sump Boxes Assemblies:
      1. 36"x36" Catch Basin: 05710
      2. Gray Iron Frame and Slot Grate: 05713

## 2.3 WATER REEL SYSTEMS:

- A. Provide water reel systems at locations indicated on drawings.
- B. Manufacturers:
  1. Subject to compliance with the requirements, products by one of the following manufacturers will be acceptable.
    - a. Reelcraft
    - b. Cox Reels
    - c. Graco, Inc.
- C. Materials:
  1. Models:
    - a. 1" Continuous Flow Reel with spring loaded return (*Min. 250 psi*)
    - b. 1" *Non-Collapsible Braided Synthetic Hose (65' length)*
    - c. 1" Couplings for Non-Collapsible Braided Synthetic Hose
    - d. 1" Brass Nozzle

## PART 3 - EXECUTION

### 3.1 FABRICATION:

- A. General: Fabricate work in shop to greatest extent possible, before application of finishes. Remove sharp and rough edges and corners from cut metal and grind welds smooth. Design components, joints, and connections to withstand most severe possible loading condition, with normal safety factor.

3.2 INSTALLATION:

- A. Install units in continuous ranges at locations shown, complying with manufacturer's instructions. Set units plumb and level with non-corrosive metal shims. Anchor adjacent units together, anchor back to back positioned units together.
- B. Install units at equal spacing unless otherwise indicated.

3.3 ADJUST AND CLEAN:

- A. Verify that all moving parts are operating freely and equipment performs in the intended manner. Clean exposed surfaces and touch-up marred finishes or replace components as necessary to eliminate evidence of damage or deterioration.

END OF SECTON 111100

## SECTION 111110 - VEHICLE WASH SYSTEMS

### 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 the following:
  - 1. Power Washers and-High Pressure Wash System
  - 2. Vehicle Undercarriage Wash System
- B. Related requirements:
  - 1. Division 3 Concrete
  - 2. Division 22 Plumbing
  - 3. Division 23 Mechanical
  - 4. Division 26 Electrical

#### 1.3 SUBMITTALS

- A. Product Data: Submit product data for materials, fabrication and installation for each type of equipment specified, including catalog cuts of anchors, hardware, fastenings and accessories. Submit manufacturer's product data showing capacities and capabilities and instructions, operating and maintenance instructions for each product.
- B. Shop Drawings: Submit shop drawings for each type of equipment not explained in manufacturer's product and data sheets, showing layout, sizes, heights, profiles, clearances, recesses, anchorages and location of services by other trades including plumbing and electrical where required.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Service And Maintenance Manuals: Submit complete details of installation, complete repair parts list showing illustrations of individual components, name and address of dealer where parts and service can be obtained.

#### 1.5 QUALITY ASSURANCE

- A. Supplier Qualifications:
  - 1. The supplier shall have been regularly engaged in the design and supply of the type of equipment specified herein, for a period of not less than five (5) years.

2. The wash system, high pressure cleaning systems, pumping stations and all electrical controls shall be designed and supplied by one supplier.
  3. All similar items shall be the products of one manufacturer.
- B. Installer Qualifications: Provide a qualified manufacturer's representative to supervise the work related to equipment installation, check out, and start up.
- C. Training: Provide a technical representative to train Owner's personnel in the operation and maintenance of specified equipment.

## 1.6 WARRANTY

- A. Pressure Washer System and Components
1. Manufacturer's standard warranty.
- B. Undercarriage Wash system
1. Warranty work specified herein is for one (1) year from the date of substantial completion against defects in materials.
    - a. Defects shall include, but not be limited to:
      - 1) Operation: Noisy, rough or substandard operation
      - 2) Parts: Loose, damaged and missing parts

## PART 2 - PRODUCTS

### 2.1 VEHICLE PPRESSURE WASHERS

- A. Manufacturer:
1. Provide sole source equipment from: Hydro Tek Systems, Inc. unless otherwise noted.
- B. Equipment:
1. Pressure Washer
    - a. Model HN25004E3G
    - b. UL 1776 Safety Standard
    - c. Flow Capacity: 3.8 GPM
    - d. Pressure: 2500 PSI
    - e. Burner Power: Natural Gas
    - f. Burner Input: 440,000 BTU
    - g. Motor Hp: 7.5
    - h. Machine Voltage: 230v/3ph
    - i. Machine Amperage: 22 Amps
    - j. Machine Dimensions: Length=47", Width=24.75", Height=48"
    - k. Provide the following options:
      - 1) Stainless steel frame
      - 2) Stainless steel back and top panels
      - 3) Full function wall-mount remote with hour meter
      - 4) Downstream soap option
      - 5) Draft diverter
  2. Remote Switch

- a. Confirm final location with Owner.
3. Hoses
  - a. Provide one each side of Wash Bay
  - b. 3000 PSI Hose
  - c. Length: 100'
4. Wands
  - a. Provide one each side of Wash Bay
  - b. Hot water wand with trigger gun and adjustable fan nozzle
  - c. Provide wall-mounted holder by manufacturer.
5. Trolley System
  - a. Provide one each side of Wash Bay
  - b. Basis of Design: Hotsy Trolley System by Hotsy Equipment Co.

## 2.2 VEHICLE UNDERCARRIAGE WASH SYSTEM

- A. Manufacturer:
  1. Subject to compliance with requirements, provide complete system by one of the following:
    - a. Interclean Equipment, LLC (Basis of Design)
    - b. Hydro-Chem Systems, Inc.
    - c. Johnson Wash Systems
- B. Scope of Work:
  1. To furnish a completely automatic, touchless heavy-duty vehicle undercarriage wash system for all types of vehicles used by fleet owners in drive-in back out mode.
  2. The supplier is to be responsible for the supply of necessary equipment, materials and service for the complete assembly and erection of the equipment so that it is ready for operation as per these specifications.
- C. Wash System Performance:
  1. The equipment specified herein is based on the drive in-back out system design by InterClean Equipment, LLC (734-961-3300).
  2. Regardless of the Owner's approval for any deviations and/or changes, the supplier is solely responsible for the performance of the supplied equipment per these specifications. All equipment and equipment functions must be built and designed to these specifications.
  3. Should the equipment not perform as per these specifications, the supplier shall modify, add and/or alter the equipment supplied at his own expense until the performance is satisfactory.
  4. The equipment offered shall be the latest standard product, modified as necessary to meet the requirements of this specification, of a type that has been commercially available and in satisfactory use for at least five years.
  5. The vehicle washer shall be actuated in cycle sequence by vehicles driven in a fixed path at a slow speed (50-60 feet / minute) through the washing system. All washing operations shall be automatically activated by the vehicle being detected by the loop sensors.
  6. The supplier is responsible to design the equipment to satisfactorily wash up to 30 vehicles per hour.
  7. The vehicle wash system to be capable of washing vehicles and construction equipment.
- D. Mechanical Interconnecting Piping:



1. All field plumbing and mechanical work will be done by the Mechanical Contractor or General Contractor, including:
  - a. Water and gas utilities up to and connecting to the equipment.
  - b. Interconnecting piping between various equipment components located in the equipment room.
  - c. Interconnecting piping between the equipment located in the equipment room and the equipment located in the wash bay.
  - d. Furnish and installation of:
    - 1) Backflow preventer
    - 2) Underground pipe for chassis wash
    - 3) Trench Drain and Grating for spray bar trench
  
- E. Electrical Interconnecting Wiring:
  1. All field electrical work will be done by the Electrical Contractor or General Contractor, including:
    - a. Electrical service up to and connecting to the equipment panel.
    - b. Interconnecting wiring between various equipment components located in the equipment room.
    - c. Interconnecting wiring between the equipment located in the equipment room and the equipment located in the wash bay.
    - d. Furnish and installation of:
      - 1) Underground conduits (if required) to be laid when concrete pad is being poured.
  
- F. Equipment:
  1. Vehicle Undercarriage Wash Unit:
    - a. Undercarriage wash units shall be 9' with 2 water manifolds each, constructed of schedule 40 stainless steel pipe. The manifolds include 13 narrow type water spray nozzles per manifold, spaced on the pipe to spray the vehicle undercarriage.
    - b. The undercarriage pipe shall be located just below the grate such that the spray patterns are not blocked by the grate bars.
  2. Pumping Module:
    - a. The high-pressure pump is of the vertical multi-stage inline pump, direct drive with floating outer casing and a dish shaped insert fitted to the intermediate casing to promote smooth flow and reduce erosion of the pump, High Temp Carbon/Silcon Carbide Graphite filled/Viton single mechanical seal and Tungsten Carbide lower pump bearing and sleeves, square edged six spline shaft which can produce pressures up to 300 PSI. The pump shall deliver a nominal flow of 90-100 GPM.
  3. Electric Motor:
    - a. The motor shall operate on 208 Volt, 3 Phase, 60 Cycle and be ODP with a 1.15 service factor.
    - b. The motor shall be sized to not exceed the name plate horsepower during operation. The motor should be a minimum of 25 HP.
  4. Electrical Control Panels and Components
    - a. The Industrial Control Panel shall be manufactured and evaluated in accordance with the Underwriters Laboratories, Inc. (UL) standard 508A (Industrial Control Panels). In addition, the panel shall be evaluated for high-capacity short circuit withstand and shall bear the appropriate UL marks including the short circuit withstand value mark as part of the official UL label.

- b. The Industrial Control Panel shall be designed to meet the requirements of the National Electric Code (NEC) Articles 430 and 670, also the National Fire Protections Association (NFPA) Standard 79 (Industrial Machinery).
  - c. Electric panels that are not UL approved are not acceptable.
  - d. The industrial control panel shall be designed for operation on a 208 Volt, 3 Phase, 60 Hertz system, with a short circuit capacity of 25,000 amperes RMS Symm. Available at the incoming line terminals of the control panel.
  - e. Control system will control the wash operation, turning system off, tank fill and low water level protection.
5. Water Holding Tank:
- a. The system shall be equipped with 400-gallon polyethylene water holding tank equipped with high and low-level float switches. The system holding tank shall be filled with water from the Owner's water treatment plant. Should the treated plant water be used, it will be equipment suppliers' responsibility to supply adequate filtering for the water purification as is required for the proper cleaning and film removing requirements.
  - b. The holding tank shall be filled via 2", slow closing float valve in the holding tank.

### PART 3 - EXECUTION

#### 3.1 PRESSURE WASHER

##### A. EQUIPMENT INSTALLATION

- 1. Install per manufacturer's recommendations.
- 2. Provide gas shut off valve within six feet of the unit.
- 3. Avoid sharp turns in vent installation.
- 4. Install in accordance with all local building and life safety codes.

#### 3.2 VEHICLE UNDERCARRIAGE WASH UNIT

##### A. EQUIPMENT INSTALLATION

- 1. Equipment shall be installed in accordance with manufacturer's supplied installation drawings.
- 2. For supported equipment, install anchor bolts that extend through concrete base and anchor into structural concrete floor.
- 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- 5. Equipment supplier shall undertake the commissioning of the system and make all required adjustments to ensure proper operation.
- 6. The equipment manufacturer shall start up the system. The Owner shall have all operating personnel present during the start-up and equipment training.
- 7. The supplier shall arrange for an adequate amount of detergent to be available for the performance testing.
- 8. The Owner's personnel shall be trained for a minimum of five (5) hours in the system's operation and maintenance.
- 9. The supplier shall provide the Owner with the names and addresses of all local service and maintenance personnel to assist in future service.

B. 2.2 CONNECTIONS

1. Install water piping adjacent to vehicle wash system including strainers, isolation valves, unions, etc. to allow service and maintenance access.

C. STARTUP SERVICE

1. Engage a factory-authorized service representative for consultation, direction and assistance for completing vehicle wash system startup. Local Distributor and Service provider CJM, 5515 Chantry Dr., Columbus, OH, 43232, 614-861-2390
  - a. Complete installation and startup checks according to manufacturer's written instructions.
  - b. Check for lubricating oil in lubricated-type equipment.
  - c. Check belt drives for proper tension.
  - d. Verify that piping and outlet piping are clear.
  - e. Check for proper equipment vibration-control supports or anchoring and flexible pipe or hose connections and verify that equipment is properly attached to substrate.
  - f. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
  - g. Test and adjust controls and safeties.

END OF SECTION 111110

## SECTION 113013 - RESIDENTIAL APPLIANCES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Microwave appliances.
  - 2. Refrigeration appliances.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Field quality-control reports.
- C. Sample warranties.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.5 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.2 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
1. Amana; a division of Whirlpool Corporation
  2. General Electric Company (GE)
  3. Whirlpool Corporation
  4. LG Electronics

## 2.3 MICROWAVE OVENS

- A. Microwave Oven:
1. Mounting: Countertop
  2. Capacity: 2.0 cu. ft.
  3. Microwave Power Rating: 1000 W.
  4. Material: Stainless Steel

## 2.4 REFRIGERATOR/FREEZERS

- A. Refrigerator/Freezer: Two-door, side-by-side refrigerator/freezer and complying with AHAM HRF-1.
1. Type: Freestanding.
  2. Storage Capacity:
    - a. Refrigeration Compartment Volume: 15.6 cu. ft.
    - b. Freezer Volume: 5.13 cu. ft.
  3. General Features:
    - a. Dispenser in door for ice and cold water.
    - b. Interior light in refrigeration compartment.
    - c. Automatic defrost.
    - d. Interior light in freezer compartment.
    - e. Automatic icemaker and storage bin.
  4. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
  5. Front Panel(s): Stainless steel

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

### 3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections.

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
  2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
  3. Operational Test: After installation, start units to confirm proper operation.
  4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 113013



## SECTION 122113 - HORIZONTAL LOUVER BLINDS

### 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. Horizontal louver blinds with aluminum slats.
  - 2. Motorized operators.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type and color of horizontal louver blind.
  - 1. Include Samples of accessories involving color selection.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from



Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

### 2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

- A. Manufacturers:
1. CACO Inc.
  2. Hunter Douglass
  3. Levolor
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
1. Width: 1 inch (25 mm).
  2. Thickness: Not less than 0.006 inch (0.15 mm).
    - a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.
- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
1. Capacity: One blind(s) per headrail unless otherwise indicated.
  2. Ends: Manufacturer's standard.
  3. Manual Lift Mechanism:
    - a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
    - b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
  4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
    - a. Tilt: Full.
    - b. Operator: Clear-plastic wand.
    - c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
  5. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard.

6. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard unless otherwise indicated.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
  1. Type: Manufacturer's standard.
- E. Lift Cords: Manufacturer's standard braided cord.
- F. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
  1. Type: Braided cord.
- G. Valance: Manufacturer's standard.
- H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
  1. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- I. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- J. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.
- K. Colors, Textures, Patterns, and Gloss:
  1. Slats: As selected by Architect from manufacturer's full range.
  2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

## 2.3 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
  1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch (6 mm) per side or 1/2 inch (13 mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
- C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
  1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

- D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish:
  - 1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
  - 1. Locate so exterior slat edges are not closer than 1 inch (25 mm) from interior faces of glazing frames through full operating ranges of blinds.
  - 2. Install mounting and intermediate brackets to prevent deflection of headrails.
  - 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

#### 3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

#### 3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION 122113



SECTION 125100 - FURNITURE

# 125100- F U R N I T U R E

NOTE: THIS FURNITURE PACKAGE SERVES AS A BASIS OF DESIGN. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ANY ONE OF THE FOLLOWING:

## FURNITURE:

- 1) THE HON COMPANY (BASIS OF DESIGN)
- 2) NATIONAL OFFICE FURNITURE
- 3) GLOBAL FURNITURE GROUP

## WASTE RECEPTACLES:

- 1) RUBBERMAID (BASIS OF DESIGN)
- 2) ULINE
- 3) CONTINENTAL COMMERCIAL PRODUCTS

SOURCE LIMITATIONS: OBTAIN ALL FURNITURE FROM A SINGLE MANUFACTURER.

Prepared for:

**Ohio Department of Transportation**  
1600 West Broad Street Columbus, Ohio 43223  
614.275.1300

+

**Ohio Facilities Construction Commission**  
30 West Spring Street Columbus, Ohio 43215  
614.466.6290

Prepared by:

**JEROME M. SCOTT ARCHITECTS**

1020 GOODALE BLVD. COLUMBUS, OHIO 43212  
PH: 614.225.9535 FAX: 614.225.9533 [www.jeromescott-architects.com](http://www.jeromescott-architects.com)

# JEROME M. SCOTT ARCHITECTS

<b>ITEM</b>	<b>PRODUCT DESCRIPTION</b>	<b>QTY</b>
<b>S E A T I N G</b>		
<b>C-1</b>	Mid-back Task Chair, Mesh Back, pivoting arms	<b>1</b>
<b>C-2</b>	Guest chair, mesh back, and upholstered seat	<b>2</b>
<b>C-3</b>	Stacking chair w/ 4 leg and upholstered seat	<b>17</b>
<b>D E S K S</b>		
<b>D-1</b>	Straight desk, w right return, full modesty, BBF and FF	<b>1</b>
<b>T A B L E S</b>		
<b>T-1</b>	Fixed height laminate table, 84"Wx30"D	<b>2</b>
<b>W A S T E R E C E P T A C L E</b>		
<b>W-1</b>	7 Gallon plastic waste receptacle	<b>3</b>
<b>W-2</b>	35 Gallon plastic open top, waste receptacle	<b>2</b>



# JEROME M. SCOTT ARCHITECTS

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## C-1 T A S K C H A I R

---

### Ignition Series: Mid-back Task Chair

HIWM2.A.S.M.UR10.T.SB

38"D x 27"W x 46.5"H

Midback, pneumatic tilt, tension, synchro-tilt, 360 degree swivel, back height adjustment, seat glide mechanism, mesh back, upholstered seat, adjustable T-arms in height & width, with 5 star base with dual soft casters.



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### LOCATION / QUANTITY

Room No.	Room Name	Qty
101	Office	1

---

**Total: 1**

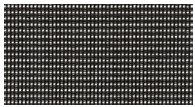
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### F I N I S H E S

---

Mesh Back



Black Fabric Seat



Black Base



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**Ohio Department of Transportation**  
1600 West Broad Street Columbus, Ohio 43223  
614.275.1300

+

**Ohio Facilities Construction Commission**  
30 West Spring Street Columbus, Ohio 43215  
614.466.6290

Product by:

**HON Company**  
200 Oak Street Muscatine, Iowa 52761  
563.272.7100

# JEROME M. SCOTT ARCHITECTS

---

## C-2 G U E S T C H A I R

---

### Ignition: Multipurpose Stacking Chair

HIGS6.F.S.IM.UR10.T

21.75"D x 25"W x 33.5"H

Black mesh backing, black fabric seat, wall saving four leg stacker with fixed arms, soft casters, and black steel frame.

---

### L O C A T I O N / Q U A N T I T Y

Room No.	Room Name	Qty
101	Office	2

---

**Total: 2**

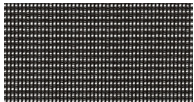
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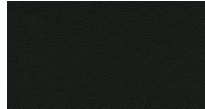
### F I N I S H E S

---

Mesh Back



Black Fabric Seat



Black Base



Prepared for:

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1600 West Broad Street Columbus, Ohio 43223  
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Product by:

**HON Company**  
200 Oak Street Muscatine, Iowa 52761  
563.272.7100

# JEROME M. SCOTT ARCHITECTS

**C-3**

**S T A C K I N G C H A I R**

Motivate Series: Stacking Chair

HMG2.N.S.ON.UR10.BLCK

23"D x 21"W x 32.25"H

Poly back stacker chair, flexible, plastic shell contoured chair back, armless, four post leg with soft casters, textured black steel frame, and upholstered seat. (Set of 2)

**L O C A T I O N / Q U A N T I T Y**

Room No.	Room Name	Qty
100	Break Room	17

**Total: 17**

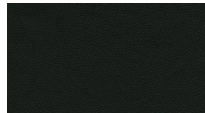
Note: Image may not reflect actual specification outlined herein.

**F I N I S H E S**

Plastic Shell Back



Black Fabric Seat



Black Base



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30 West Spring Street Columbus, Ohio 43215  
614.466.6290

Product by:

**HON Company**  
200 Oak Street Muscatine, Iowa 52761  
563.272.7100

# JEROME M. SCOTT ARCHITECTS

**D-1**

**L - D E S K**

## 10500 Series: Desk

H105898L.CC/ H105907R.CC

66"W x 36"D x 29.5"H Desk/  
42"W x 24"D x 29.5"H Return

Desk shell with full modesty panel and 2 grommets, abrasion and stain resistant laminate over solid core high performance particleboard, 3/4" range adjustable leveling floor glides, with floorstanding full height Box/Box/File pedestal (core removable lock). Right return has one work surface grommet and a floorstanding full height File/File pedestal. File drawers accept hanging folders in letter or legal; hangrails included.



### LOCATION / QUANTITY

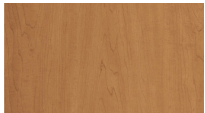
Room No.	Room Name	Qty
101	Office	1

**Total: 1**

Note: Image may not reflect actual specification outlined herein.

### FINISHES

C Harvest Laminate  
Grade L1



Prepared for:

**Ohio Department of Transportation**  
1600 West Broad Street Columbus, Ohio 43223  
614.275.1300

+

**Ohio Facilities Construction Commission**  
30 West Spring Street Columbus, Ohio 43215  
614.466.6290

Product by:

**HON Company**  
200 Oak Street Muscatine, Iowa 52761  
563.272.7100

# JEROME M. SCOTT ARCHITECTS

## T-1 R E A D Y R O O M T A B L E

### Motivate Series: Fixed Height Nesting Table

HMVR-3084G-FX.N.C.C.C.S

84"W x 30"D x 29.5"H

Laminate top table with 2mm edge, fixed post leg and y-base. Ganging accessories.  
(Hard floor casters)

### L O C A T I O N / Q U A N T I T Y

Room No.	Room Name	Qty
100	Break Room	2

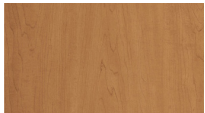


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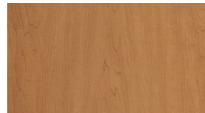
**Total: 2**

### F I N I S H E S

C Harvest Laminate Top  
Grade L1



C Harvest Laminate 2mm Edge  
Grade L1



Black Base



Prepared for:

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1600 West Broad Street Columbus, Ohio 43223  
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+

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30 West Spring Street Columbus, Ohio 43215  
614.466.6290

Product by:

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200 Oak Street Muscatine, Iowa 52761  
563.272.7100

# JEROME M. SCOTT ARCHITECTS

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## W-1 WASTE RECEPTACLE

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### Desk Side Plastic Wastebasket

FG295600 BLA

10.2"W x 14.4"D x 15"H

All plastic construction, rectangular, rolled rim for added strength, easy to clean, fits under desk height, 7 gallon capacity.



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### LOCATION / QUANTITY

Room No.	Room Name	Qty
100	Break Room	2
101	Office	1

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**Total:** 3

Note: Image may not reflect actual specification outlined herein.

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### FINISHES

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Black BLA



Prepared for:

**Ohio Department of Transportation**  
1600 West Broad Street Columbus, Ohio 43223  
614.275.1300

+

**Ohio Facilities Construction Commission**  
30 West Spring Street Columbus, Ohio 43215  
614.466.6290

Product by:

**Rubbermaid**  
4110 Premier Drive High Point, NC 27265  
888.895.2110

# JEROME M. SCOTT ARCHITECTS

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## W-2 W A S T E R E C E P T A C L E

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Atrium Classic Container w/ Funnel Top

FG905800 BLA

25"W x 25"D x 33.3"H

35 Gallon capacity, Heavy-duty plastic open-top construction, molded-in color and UV inhibitors, resists dents and fading, built in side handles, FM approved, Textured finish



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### L O C A T I O N / Q U A N T I T Y

Room No.	Room Name	Qty
103	Truck Storage	2

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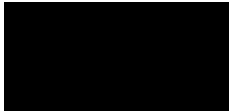
Total: 2

Note: Image may not reflect actual specification outlined herein.

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### F I N I S H E S

Black BLA



## END OF SECTION 125100

Prepared for:

**Ohio Department of Transportation**  
1600 West Broad Street Columbus, Ohio 43223  
614.275.1300

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**Ohio Facilities Construction Commission**  
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## SECTION 220001 - PLUMBING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.
- B. Plumbing Contractor is responsible for the Work described in the following Sections, unless otherwise noted. In these Sections, the term "Contractor" shall mean the Contractor performing Work on this Project, unless otherwise noted.
  - 1. For Plumbing Work, refer to Division 22, "Plumbing," Sections 22 00 00 through 22 99 99 (as included).
  - 2. For ice machine work, refer to Division 11, "Equipment," Section 11 47 00, "Ice Machines."
  - 3. For HVAC work, refer to Division 23, "Heating, Ventilating, and Air Conditioning," Section 23 11 23, "Facility Natural-Gas Piping."
  - 4. For site work, refer to Division 33, "Utilities":
    - a. Section 33 51 00, "Natural Gas Distribution."

#### 1.02 DESCRIPTION

- A. Furnish material, labor, tools, accessories, and equipment to complete and leave ready for operation all plumbing systems of this Project as described in these Specifications and as shown on the Drawings.
- B. It is the intent that the Plumbing Work be complete in every respect. Installation shall comply with the Latest Enforced Edition of all applicable Codes, Regulations, Rules and Standards (including all interim agreements in effect), unless otherwise noted.
- C. Shop drawings for the installation of a plumbing system shall be submitted and reviewed by the Associate Architect before any plumbing work is installed, enlarged, or extended. Under NO circumstances shall any Work be performed prior to receiving shop drawings reviewed by the Associate Architect.
- D. Use sufficient workers and competent supervisors in execution of this portion of the Work to ensure proper and adequate installation throughout. In the acceptance or rejection of installed plumbing system, no allowance will be made for lack of skill on the part of workers.
- E. Coordinate location of all work with all trades and equipment.
- F. Work includes, but is not limited to, the following:
  - 1. Plumbing insulation.
  - 2. Interior domestic water piping system.
  - 3. Interior sanitary piping system.
  - 4. Compressed air piping system.
  - 5. Plumbing equipment:
    - a. Water heater.
    - b. Air compressor.
    - c. Refrigerated air dryer
  - 6. Plumbing fixtures.
  - 7. Interior natural gas piping system. Refer to Section 23 11 23.
  - 8. Site plumbing work:
    - a. Gas service. Refer to Section 33 51 00.



1.03 LICENSES

- A. Only a Contractor and craftsmen licensed by the State shall install this Plumbing Work.
- B. Obtain all permits, licenses, and certifications required by the Code Authority Having Jurisdiction.

1.04 COMPLETION OF PLUMBING SYSTEM

- A. The plumbing system shall not be considered complete and acceptable unless, and until, all Code and Governing Agency requirements are satisfied.
- B. Refer to Division 01, Section 22 05 00, and Section 22 05 60 for additional requirements.

END OF SECTION 220001

## SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 REFERENCE

- A. The General Provisions listed in this Section are in addition to the requirements referenced below. They are not meant to replace them, but they shall supersede any conflicting statements contained elsewhere in the Specifications. Contractor is responsible for the more restrictive requirement between these Division 22 General Provisions and other requirements contained elsewhere in the Specifications.

#### 1.03 ABBREVIATIONS AND SYMBOLS

- A. Titles and abbreviations may be used in these Specifications. Abbreviations may be shown on Plumbing Drawings. Refer to the list of abbreviations attached to this Section. Refer also to Division 01 and the symbols lists shown on the Drawings for further abbreviations. All titles and abbreviations may not necessarily apply to this Work.

#### 1.04 STANDARDS OF QUALITY

- A. Contractor shall provide Work of the highest quality, conforming to the accepted practices and standards of the Trades involved.
- B. Any Law, Code, Standard, Rule or Regulation (including all interim agreements in effect) referred to in other Sections of Division 22 is included in its entirety as a part of these Specifications.
- C. The following Codes (including any interim agreements in effect) apply to this Work:
  - 1. State of Ohio:
    - a. Most recent version of Building Code.
    - b. Most recent version of Plumbing Code.
    - c. Most recent version of Mechanical Code
  - 2. National:
    - a. National Electrical Code.
    - b. Americans with Disabilities Act (36 CFR 1191).
    - c. National Fire Protection Association. Codes as listed in subsequent Specification Sections.
    - d. American Society of Mechanical Engineers Welding Code B31.1.0.
- D. Licensed Contractors shall perform Work as required by State Codes.
- E. Methods and materials shall be certified where noted in the individual Specification Sections.
- F. All equipment and appliances installed on this Project shall bear the label of an Approved Testing Agency, and shall be installed in accordance with the Manufacturer's instructions for the labeled equipment and appliances.
- G. All structural steel used on this Project shall be manufactured in the United States, per Ohio Revised Code 153.011.

### 1.05 CONTRACT DRAWINGS

- A. Drawings are schematic and show approximate locations, general arrangement, and extent of Work. The Contract Drawings are not intended to show every vertical or horizontal offset that may be necessary to complete the systems. Having piping and fittings fabricated and delivered in advance of making actual measurements shall not be sufficient cause to avoid making offsets or other changes as may be necessary to install piping and equipment. Verify exact locations in the field, and coordinate with all trades.
- B. The A/E shall approve, in writing, significant deviations from Drawings.
- C. The A/E reserves the right to make minor changes in location that do not require additional labor or material, up to the time of roughing-in, without additional cost. The A/E reserves the right to determine what is “significant” and what is “minor.”
- D. If a conflict occurs between the Drawings and Specifications, immediately submit a written request for an interpretation or clarification from the A/E, who shall determine which interpretation has precedence. Refer to the General Conditions.

### 1.06 DEFINITIONS

- A. “Provide”: To furnish, install, and connect to make completely ready for regular operation.
- B. “Furnish”: To supply or deliver to site complete with all required accessories and installation instructions.
- C. “Install: To mount, erect, hang, or fasten in place, and connect to make ready for regular operation.
- D. “Concealed”: Either embedded in masonry or other construction, or installed below floor slab, behind wall furring, within walls, within double partitions, above ceilings, in trenches, in tunnels, or within crawl spaces.
- E. “Exposed”: In full or partial view; not “Concealed” as defined above.
- F. “Accessible Ceiling”: Lay-in ceiling with removable ceiling tiles.
- G. “Piping”: Pipe, fitting, flanges, valves, controls, specialties, hangers, bracing, insulation, and other items required or necessary.
- H. “Shall”: Indicates a mandatory requirement.
- I. Refer to additional Definitions in Division 01, and the State Building and Mechanical Codes.

### 1.07 APPLICABLE CODES, LICENSES, PERMITS, FEES, AND NOTICES

- A. The A/E will submit all Contract Drawings and Specifications to the State of Ohio Department of Commerce, Division of Industrial Compliance, Bureau of Construction Compliance, pay the application fee to secure Plan Approval, and obtain and pay for the Plan Approval Certificate.
- B. Secure and pay for the State building permit, and any ADDITIONAL permits, governmental fees, bonds, licenses, and inspections required for the proper execution and completion of the Plumbing Work.
- C. Pay for the gas line tap charges, house line test and inspection fees assessed by the Gas Utility Company.
- D. Give notice and comply with all Laws, Ordinances, Rules, Regulations, and lawful orders of the Code Authority having Jurisdiction bearing on the performance of the Plumbing Work.

- E. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, it shall promptly notify the A/E in writing, and any necessary changes will be arranged by the A/E.
- F. If the Contractor performs any Work knowing it to be contrary to such Laws, Ordinances, Rules, and Regulations, and fails to give prior notice to the A/E, the Contractor shall assume full responsibility for, and shall bear all costs associated with, correcting the Work.

#### 1.08 EXAMINATION OF SITE

- A. Certain existing conditions may affect the manner or sequence of the performance of the Work. Existing services, structures, and operating schedules may need to be reviewed prior to bidding to facilitate the installation of the Work without disrupting the normal operation of the facility.
- B. Before submitting its Bid, the Contractor should visit the site of the proposed Project. After receipt of Bids, no allowances will be made for lack of knowledge of Project conditions.
- C. Should the Contractor note any discrepancies during the Bidding Period, it shall notify the A/E immediately, in writing, to permit issuance of an Addendum to prevent misunderstandings at a later date.

#### 1.09 UTILITIES AND OUTAGES

- A. Locate and touch all existing utilities prior to construction. Where necessary to make minor relocations to permit installation of the Plumbing Work, make all such relocations. Advise the A/E immediately of major conflicts to permit modification of the Contract Documents prior to bidding.
- B. Record the location of all concealed utilities on the Record Drawings.
- C. Coordinate any utility service shutdowns or outages with the A/E and Owner. Conform to all Utility Company requirements. Avoid inconveniencing the Owner. Provide temporary service during the curtailment, if required by the A/E.
- D. Notify the Owner at least (2) working days in advance of commencing work in the area of existing utilities.
- E. Contractor shall alert occupants of nearby premises of any emergency conditions that arise as a result of its work in connection with existing utilities.
- F. Contractor shall coordinate any new utility main extensions with the local utility provider.

#### 1.10 COORDINATION

- A. Contractor shall coordinate its Work carefully with all trades.
- B. Consult all Contract Drawings that may affect the location of any equipment, apparatus and piping, and make any other adjustments in location as necessary to secure coordination.
- C. Contractor shall be responsible for the cost of additional engineering work required for changes to the work as shown or described, due to the relocation of items requested by the Contractor.

#### 1.11 RECORD DRAWINGS

- A. Maintain, at the job site, (1) set of the Drawings and Specifications that shall be used exclusively for documenting and recording the exact location of all installed Work. The Record Drawings and Specifications shall be available for inspection anytime during normal working hours.
- B. Record deviations in locations of concealed piping, valves, equipment, and all buried, or concealed, utility services, piping, etc., dimensioned from a fixed control point, including depth of bury, invert elevations at start of storm or sanitary line, at each change of direction, at each change of slope, and

as required for further reference. Minor piping variations need not be recorded. Record locations of abandoned piping, including exterior lines.

- C. Record all Addendum and Change Order Items.
- D. Add valve tag numbers to Drawings.
- E. Record deviations made necessary to incorporate equipment different from the Design Base equipment.
- F. Contractor shall deliver (1) copy of its Record Drawings to the A/E.

#### 1.12 GUARANTEE

- A. Contractor shall guarantee its equipment, workmanship, and materials for a period of (1) year from the date of Contract Completion. Should defects develop within this period, the Contractor shall, at no cost to the Owner, remedy the defects and reimburse the Owner for all damage to other Work caused either by the defects or as a result of the work of correcting the same.
- B. Refer also to Division 01 and other Specification Sections that define the starting date of the guarantee period, or that discuss either additional warranty requirements, or extended equipment warranties beyond the standard period.

### PART 2 PRODUCTS

#### 2.01 DESIGN BASE MANUFACTURER STANDARD

- A. The Drawings and Specifications are based on the specific equipment requirements and configuration for a Design Base Manufacturer. Design coordination of equipment with the building and with other Trades has been made for this specific Model and Manufacturer of equipment. Where several Manufacturers are listed for an item of equipment or material, the first-named shall be considered the Design Base Manufacturer Standard.
- B. Consideration will not be given to any other Manufacturer that the Contractor proposes to use, unless the Manufacturer has been approved by the A/E and specifically named in the Contract Documents or Addenda thereto.

#### 2.02 OTHER MANUFACTURERS

- A. No consideration will be given to any Manufacturer which the Contractor proposes as an "Approved Equal," unless the Manufacturer has been approved by the A/E during the bid period and specifically named in the Contract Documents or Addenda thereto.
- B. Recognizing that since no two Manufacturers are "identical," whenever the Contractor elects to furnish specified equipment or material manufactured by other than the Design Base Manufacturer, the Contractor shall be responsible for the cost and coordination of all modifications required to accommodate the elected equipment or material, including any Work of other Trades that might be affected. Where changes to other Trades' Work are required, the Contractor shall include the additional costs of all such Work in its bid.
- C. Where deemed necessary by the A/E, the Contractor shall, at no additional cost to the Owner, prepare new layouts for these other brands of equipment which may have different dimensional or service requirements from the Design Base Manufacturer Standard. Submit these layouts to the A/E for review.
- D. Reimburse the A/E for the cost of any design changes incurred by the A/E in the preparation of revised Drawings or Specifications to accommodate the use of any Manufacturer other than the Design Base Manufacturer.

### 2.03 ALTERNATIVE MANUFACTURERS

- A. Contractor shall submit information on any proposed equipment or material that it desires to use as an Approved Equal.
- B. If the A/E determines an alternative Manufacturer to be acceptable, it will issue an Addendum adding that Manufacturer to the Specification.

### 2.04 EQUIPMENT SUITABILITY

- A. All equipment provided shall perform as intended. All items listed shall function properly, and as the Manufacturer intended. Install equipment according to the Manufacturer's recommendations. Properly attach equipment to the floor, wall, or structure. Each item of equipment shall be compatible with all other accessories or hook-ups, including piping, controls, wiring, and other equipment that are not furnished by the equipment Manufacturer, but that are required as an accessory or modification, as necessary to achieve its intended function.

### 2.05 MISCELLANEOUS ACCESSORIES

- A. Provide any additional adapters, fittings, trim, structural steel angles, channels, Unistrut, brackets, etc., as necessary to securely mount and install all items of equipment specified or shown on the Drawings. All steel installed outside or exposed to moisture shall be hot-dipped galvanized.
- B. These accessories are required even though they may not be shown or detailed on the Drawings.
- C. Installation shall be compatible with the building construction on which the item is to be located.
- D. Verify the type of construction prior to ordering the equipment item, so that all required accessories are included.

### 2.06 QUANTITIES

- A. Equipment may be referred to in these Specifications, or on the Drawings, as either singular or plural; the Contractor shall verify the exact number of items required to complete its Work.

## PART 3 EXECUTION

### 3.01 EQUIPMENT PROTECTION

- A. Unless equipment and material can be protectively stored in a manner acceptable to the A/E, it shall not be delivered to the site until the Work is ready to receive it.
- B. Protect all equipment and materials during construction from damage by weather, water, dirt, paint droppings, welding and cutting spatters, and other construction activities.
- C. All materials or equipment stored outside shall be elevated and protectively covered in a secured and locked area.
- D. Store materials and equipment sensitive to weather or construction conditions inside. Where necessary, store sensitive equipment in a heated area.
- E. During construction, cover all equipment and other items that are susceptible to damage until they can be installed in place.
- F. Immediately repair or replace damaged equipment or materials to the satisfaction of the A/E and at no additional cost to the Owner.
- G. Contractor shall protect the building and other Contractors' material and equipment from damage caused by its Work. Protect floors from cutting oil and chips.
- H. Use all means necessary to protect materials before, during, and after installation.

- I. Refer also to individual Specification Sections for specialized protection.

### 3.02 EQUIPMENT ACCESS

- A. Locate all units to provide sufficient access to service items requiring periodic maintenance. Coordinate with structure and with all trades.

### 3.03 CUTTING AND PATCHING

- A. Contractor shall perform all cutting and patching required for installing its own Work except as otherwise noted. Cutting shall be done with such tools and methods so as to prevent unnecessary damage to surrounding areas and equipment. Use rotary drills where the cutting of holes through concrete, brick, plaster, or tile is necessary. All cutting shall be accomplished in a neat and workmanlike manner, acceptable to the A/E. Patching shall be performed in accordance with Section 01 73 29, "Cutting and Patching." No cutting shall be done that will, in any way, reduce the structural strength of the building. Cutting of structural support beams, joists, plates, or other structural members is strictly prohibited without the specific written consent of the A/E and the Structural Engineer. Should such cutting be necessary, consult the A/E and do not proceed further without written approval of the A/E.
- B. Cutting and patching includes remodeling and repairing of previously graveled or paved areas, walks, curbs, sod, floors, etc., as may be required. Saw cuts shall be done in neat, straight lines.
- C. Coordinate drilling, welding, etc. and method of attachment to columns, joists, beams, purlins, etc., with the Structural Engineer before proceeding.
- D. In lieu of sleeves in precast concrete work, cut holes after erection of concrete. Verify with the A/E that all openings to be field-cut are in conformance with the Precast Manufacturer's specifications before any cutting or drilling proceeds.
- E. Contractor shall be responsible for patching. Only a qualified Finish Tradesman, skilled in the respective craft required, shall perform patching. Patching shall match adjacent surface construction. Materials and equipment used in the patching work shall comply with requirements of other Sections of this Specification relating to material to be used in new construction. All patching shall be accomplished in a neat and workmanlike manner, acceptable to the A/E.
- F. All cutting and patching shall be done promptly, and all repairs shall be made as necessary to leave the entire Work in good condition, including all cutting, fitting, and drilling of masonry, concrete, metal, wood, plaster, and other materials as specified or required for proper assembly, fabrication, installation, and completion of the Work.
- G. Contractor shall be responsible for all other cutting of the slab related to its own Work. Any re-cutting and patching of the slab shall be done at the Contractor's expense.
- H. Contractor shall repair or replace any roads, sidewalks, or other items that its employees may damage during the performance of this Work.
- I. Refer to Section 01 73 29 for additional requirements.

### 3.04 PAINTING AND RELATED WORK

- A. Contractor shall repaint any previously finished areas disturbed by its own cutting and patching. Painting of the patched area shall match color of the adjacent construction in the general area of the patch. The entire wall-to-wall and floor-to-ceiling surface shall be repainted if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up. **ALL PAINTING SHALL BE DONE BY A QUALIFIED TRADESMAN SKILLED IN THE CRAFT.**

- B. Clean, spot-prime with zinc chromate, and finish equal to the original quality any new factory-finished equipment that has rusted, has been damaged, or has deteriorated. The entire surface shall be repainted if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.
- C. Clean all insulation coverings. If pre-sized insulation is not used, insulation coverings shall be sized if finish painting is required.
- D. Clean, remove rust from, and zinc-chromate prime any plumbing support steel and bare ferrous metal, which is not factory-painted, shop-painted, or galvanized, and which remains exposed to view in the finished areas of the building, including mechanical rooms and storage rooms.
- E. Clean, remove rust from, zinc-chromate prime, and aluminum-bronze paint all steel hangers, boxes, straps, and rods, furnished under this Contract, which are not provided with rust-protective finish or are damaged in installation, and which remain exposed to view or are in unfinished and mechanical spaces.
- F. Give a prime coat of paint to ferrous metal installed outside the building that is not factory-painted, shop-painted, or galvanized.
- G. Paint exposed exterior gas piping.
- H. All painting shall conform to the requirements of Section 09 90 00.

### 3.05 CLEANING

- A. Maintain all work areas in a neat and orderly manner, free of debris. Clean up all occupied travel areas at the end of each shift, or immediately after use for material removed.
- B. It is the intent of the Specifications that all Contractors and Subcontractors do their own cleanup, move materials that are in the way of construction, repair and replace any damage they do, and do any other work of a similar nature which must be done.
- C. Upon completion of Work, thoroughly clean all fixtures, material, and equipment of stickers, dirt, grease, rust, oil, and other foreign matter. Prepare for finish painting, where painting is specified.
- D. Before final acceptance of the work, thoroughly clean all finished surfaces of equipment of dirt and dust, and touch up all scratched or damaged surfaces with matching material. Repair dents and marred finishes to the satisfaction of the A/E.
- E. Clean interiors of all enclosures of dirt and debris before installing trim or covers.
- F. Rust spots on any part shall be brushed clean, primed, and painted in kind.
- G. Clean galvanized piping in exposed areas with diluted acetic acid.
- H. Clean copper piping in exposed areas with fine emery cloth and solvent.
- I. Clean all gauges, thermometers, traps, dirt legs, strainers, and fittings.
- J. Refer to Division 01 for additional requirements.

### 3.06 TESTS AND INSPECTION

- A. The Contract Documents, Laws, Ordinances, Rules, Regulations (including all interim agreements) or Orders of any Code Authority Having Jurisdiction may require portions of the Work to be inspected, tested, or approved.
- B. Test and check all drain valves and gauges for proper operation. Submit a written record of these tests to the A/E.



- C. Arrange for inspection of the Work by the Code Authority having Jurisdiction. Inspections shall be conducted by the State of Ohio Department of Commerce, Division of Industrial Compliance, Bureau of Construction Compliance.
- D. Notify the A/E of all scheduled tests and adjustments at least 48 hours before they are scheduled, so that it may witness same. If the Contractor performs any test or adjustment without the A/E present, or without proper notification, it shall perform the test or adjustment a second time, in the presence of the A/E. Coordinate all test schedules with the Owner to minimize inconvenience.
- E. Concealed lines shall be tested and approved before being concealed. If a leak appears during the final test, repair the line and any damage resulting from the leak.
- F. After Work has been completed, but before pipe covering has been applied, test each system as required by other Sections of this Specification. At the test pressures, the circulation shall be free and the piping shall be proven free of leaks.
- G. Secure required certificates of inspection, testing, or approval, and include them in the Operating and Maintenance manuals.
- H. Contractor shall bear all costs of such inspections, tests (including any re-testing required), or approvals.
- I. Should any of the Work be covered up or enclosed prior to completion of all required inspections and approvals, uncover the Work as required for inspections and, after it has been completely inspected and approved, make all repairs and replacements with such materials and workmanship as are necessary to secure the approval of the A/E, and at no additional cost to the Owner.
- J. Furnish all test pumps, gauges, equipment, and personnel required, and test as necessary, to demonstrate the integrity of the finished installation to the approval of the Code Authority Having Jurisdiction and the A/E.
- K. Check each piece of equipment for defects and verify that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

### 3.07 SAFETY

- A. Exercise precaution for the protection of persons and property. Provide guard rails, barricades, enclosures, canopies, passageways, lanterns, warning lights, and other protective safety devices as necessary or required by the Code Authorities Having Jurisdiction, and as required to protect persons and property against accidentally dropped materials or other construction hazards.
- B. In no case shall the Owner or A/E be responsible for construction means, methods, techniques, sequences of procedures, or safety precautions and programs in connection with the Work. The Owner or A/E shall not be responsible for any Contractor's failure to employ proper safety procedures.
- C. Contractor shall be solely responsible for the structural design of all temporary items that it uses in the construction of the building, or that become a permanent part of the building, including, but not limited to, hoisting, shoring for concrete and masonry work, the temporary bracing for structural steel, the shoring of cut earth banks, suspended ceilings, equipment, walls, etc.
- D. Provide protection as may be required to prevent glass breakage. Replace broken glass at no cost to the Owner.
- E. All procedures shall comply with the latest regulations of the Occupational Safety and Health Administration.

3.08 BLOCK COURSE COORDINATION

- A. The mounting heights of items are called out on the Drawings for many items. Adjust equipment mounting heights to accommodate brick or block coursing. Coordinate installation of all items in a masonry wall with the A/E.

3.09 ACCESS PANELS

- A. Provide all access panels required for concealed plumbing work as shown on the Architectural Drawings.

3.10 AIR HANDLING PLENUMS

- A. Where space is used for air handling, such as above ceilings and elsewhere, do not install combustible or noxious materials.
- B. All materials shall be listed for use in air handling plenums. All wiring shall be UL 910-listed.

3.11 FACTORY INSTALLATION AND START-UP

- A. For those items of equipment that are to be installed, tested, started up, and certified by a factory-trained Representative, furnish a letter from the Factory to the A/E stating that this service shall be provided for this Project, describing the scope of services to be provided, and disclosing the name of the Representative assigned to provide the required services.

TITLES, ABBREVIATIONS, AND SYMBOLS

&	And	ARI	Air-Conditioning and Refrigeration Institute
@	At		
∠	Angle	ARR'T.	Arrangement
∅	Diameter	ASA	Acoustical Society of America
#	Number	ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
∅	Round OR Phase		
A.	Compressed air		
A.D.	Access door	ASME	American Society of Mechanical Engineers
A.D.	Area drain		
A.F.F.	Above finished floor	ASSE	American Society of Sanitary Engineers
A.P.	Access panel		
AABC	Associated Air Balance Council	ASTM	American Society for Testing and Materials
AB.	Above		
ACI	American Concrete Institute	AUTO.	Automatic
ACPA	American Concrete Pipe Association	AV	Acid vent
		AW	Acid waste
ADA	Americans with Disabilities Act	AWS	American Welding Society
ADC	Air Diffusion Council	AWWA	American Water Works Association
AH	Air handler		
ALT.	Alternate	B.D.D.	Backdraft damper
ALUM.	Aluminum	B.T.	Bathtub
AMCA	Air Movement and Control Association	B.V.	Backwater valve
		BAL.	Balancing
ANSI	American National Standards Institute	BFP	Backflow preventer
		BHP	Brake horsepower
APPROX.	Approximately	BLDG.	Building
ARCH.	Architect	BSBD.RAD.	Baseboard radiation
		BSMT.	Basement

BTM.	Bottom
BTU	British thermal unit
C.B.	Catch basin
C.I.	Cast iron
C.O.	Clean out
C/C	Center to center
C/L	Center line
CAB.	Cabinet
CAP.	Capacity
CEIL./CLG.	Ceiling
CFH	Cubic feet per hour
CFM	Cubic feet per minute
CGA	Compressed Gas Association
CHEM.	Chemical
CISPI	Cast Iron Soil Pipe Institute
COL.	Column
COMB.	Combination
CONC.	Concrete
COND.	Condensate OR Condenser
CONN.	Connection OR Connect
CONST.	Construction
CONTR.	Contractor
CONV.	Convactor OR Converter
COORD.	Coordinate
CS	Commercial Standard
CSA	Canadian Standards Association
CU.FT.	Cubic feet
CUH	Cabinet unit heater
D.	Deep
D.F.	Drinking fountain
D.L.	Door louver
D.M.	Damper motor
D.S.	Downspout
DB	Dry bulb
DBL.	Double
DCW	Domestic cold water
DET.	Detail
DHW	Domestic hot water
DHWR	Domestic hot water return
DIA. / Ø	Diameter
DIFF.	Diffuser
DIM.	Dimension
DISCH.	Discharge
DN.	Down
DPR.	Damper
DR.	Door
DW	Distilled water
DWG.	Drawing
DWH	Domestic water heater
DWV	Drain, waste and vent

E.A.T.	Entering air temperature
E.C.	Electrical Contractor
E.S.P.	External static pressure
E.T.	Expansion tank
E.W.T.	Entering water temperature
EA.	Each
EFF.	Efficiency
ELEC.	Electric OR Electrical
ELEM.	Element
ELEV.	Elevation
ENGR.	Engineer
ENT.	Entering
EPA	Environmental Protection Agency
EQUIP.	Equipment
EW	Eye wash
EWC	Electric water cooler
EXH.	Exhaust
EXIST.	Existing
EXT.	Exterior
F & T	Float and thermostatic
F.	Fan OR Fire
F.D.	Fire damper
F.E.	Fire extinguisher
F.E.C.	Fire extinguisher cabinet OR Food Service Equipment Contractor
F.H.	Fire hydrant
F.H.C.	Fire hose cabinet
F.H.E.C.	Fire hose/extinguisher cabinet
F.V.	Flush valve
FCC	Federal Communications Commission
FD	Floor drain
FDA	Food and Drug Administration
FHA	Federal Housing Administration
FIG.	Figure
FIN.	Finish
FIN.RAD.	Finned radiation
FLEX.	Flexible
FLR. / FL.	Floor
FMG	Factory Mutual Global
FOR	Fuel oil return
FOS	Fuel oil supply
FPM	Feet per minute
FSC	Fire Suppression Contractor
FT.	Feet
FT.HD.	Feet of head
FURN.	Furnish(ed)
G	Gas
G.C.	General Contractor

G.I.	Grease interceptor	LPC	Low pressure steam condensate
G.T.C.	General Trades Contractor	LPS	Low pressure steam
GALV.	Galvanized	LV'G.	Leaving
GEN.	General		
GPM	Gallons per minute	M.A.	Mixed air
GR	Grille	M.O.	Motor operated
GRAV.	Gravity	MAN. DPR.	Manual damper
		MAT.	Material
H./HT.	Height	MAX.	Maximum
H.P.	High pressure	MBH	1,000 British thermal units/hour
H.S.	Hair strainer	MECH.	Mechanical
H'STAT	Humidistat	MET./MTL.	Metal
HAC	Heating and air conditioning	MEZZ.	Mezzanine
HB	Hose bibb	MFR.	Manufacturer
HHS	United States Department of Health and Human Services	MH	Manhole
		MIN.	Minimum
HORIZ.	Horizontal	MISC.	Miscellaneous
HP	Horsepower	MPS	Medium pressure steam
HPC	High pressure steam condensate	MS	Motor starter
HPS	High pressure steam	MSS	Manufacturers Standardization Society
HTG.	Heating		
HTR.	Heater	MTD./MT.	Mounted OR Mount
HUD	United States Department of Housing and Urban Development	N.I.C.	Not in contract
		N.T.S.	Not to scale
HV	Heating and ventilating OR High velocity	N2	Nitrogen
		N2O	Nitrous oxide
HVAC	Heating, ventilating, and air conditioning	NAECA	National Appliance Energy Conservation Act
I.D.	Inside diameter	NB	National Board of Boiler and Pressure Vessel Inspectors
IEC	International Electrotechnical Commission	NCPI	National Clay Pipe Institute
ICC A117.1	Accessibility Guidelines	NEBB	National Environmental Balancing Bureau
IN.	Inside OR Inches	NEC	National Electrical Code
IND. U.	Induction unit	NEMA	National Electrical Manufacturers Association
IND.	Indirect		
INSUL.	Insulation	NESHAPs	National Emissions Standards for Hazardous Air Pollutants
INT.	Interior	NFPA	National Fire Protection Association
INV.	Invert		
INV. ELEV.	Invert elevation	NIOSH	National Institute for Occupational Safety and Health
IRI	Industrial Risk Insurers		
ISO	International Organization for Standardization	NO. OR #	Number
		NOM.	Nominal
J.R.	Janitor's receptor	NSF	National Sanitation Foundation
JCAH	Joint Commission for Accreditation of Hospitals		
		O.	Oxygen
L.	Length	O.A.	Outside air
L.A.T.	Leaving air temperature	O.D.	Outside diameter
L.W.T.	Leaving water temperature	O.I.	Oil interceptor
LAB	Laboratory	O.V.	Outlet velocity
LAV	Lavatory	O/C	On center
LH	Left hand		

ODH	Ohio Department of Health	RW	Raw water
ODMH	Ohio Department of Mental Health	RWC	Rainwater conductor
ODMR/DD	Ohio Department of Mental Retardation and Developmental Disabilities	S & R	Supply and return
ODOE	Ohio Department of Energy	S	Sink
ODOT	Ohio Department of Transportation	S. DPR.	Smoke damper
ODRC	Ohio Department of Rehabilitation and Correction	S.A.	Shock absorber
ODYS	Ohio Department of Youth Services	S.A.	Supply air
OPG.	Opening	S.F.	Square feet
OPP.	Opposite	S.M., S/M	Sheet metal
OSHA	Occupational Safety and Health Administration	S.P.	Static pressure
OU./OZ.	Ounce	S.S.	Service sink
∅	Phase OR Round	S.S.	Storm sewer
P.D.	Pressure drop	S.S., S/S	Stainless steel
P.I.V.	Post indicator valve	SAN.	Sanitary sewer
P/L	Property line	SB	Shampoo bowl
PDI	Plumbing & Drainage Institute	SD	Shower drain
PEI	Petroleum Equipment Institute	SD	Smoke detector
PLBG.	Plumbing	SECT.	Section
PNEU.	Pneumatic	SHR.	Shower
PRESS.	Pressure	SHT. MT'L.	Sheet metal
PROP.	Propeller	SHT.	Sheet
PRV	Pressure-reducing valve	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
PSF	Pounds per square foot	SPEC.	Specification
PSI	Pounds per square inch	SQ.	Square
PSIG	Pounds per square inch gauge	SQ.FT.	Square feet
PT	Plaster trap	ST	Sound trap
∅	Round OR Phase	STAT	Thermostat
R	Register	STD.	Standard
R.A.	Return air	STL.	Steel
R.D.	Roof drain	STM.	Storm
R/W	Right of way	SUCT./S	Suction
RAD.	Radius OR Radiation OR Radiator	SW	Softened water
RECIRC.	Recirculating	SW.	Switch
REG.	Register	T.W.	Tempered water
REINF.	Reinforced	T'STAT	Thermostat
REL.	Relief	TD	Temperature difference
REQ'D.	Required	TEMP.	Temperature
RH	Right hand	THERM.	Thermometer OR Thermostat
RHC	Reheat coil	TYP.	Typical
RM.	Room	UC	Undercut
RPM	Revolutions per minute	UFC	Uniform Fire Code, International Fire Code Institute
RTA/C	Rooftop air-conditioning unit	UH	Unit heater
		UL	Underwriters Laboratories, Inc.
		UR	Urinal
		UV	Unit ventilator
		V.	Vent
		V.T.R.	Vent through roof
		VAC.	Vacuum

VC	Vacuum cleaning
VCP	Vitrified clay pipe
VERT.	Vertical
VIB. ISO.	Vibration isolator
VSP	Vitrified sewer pipe
<hr/>	
W.	Width OR Water
W.G.	Water gauge
W/	With
W/O	Without

W/W	Wall to wall
WAT.	Water
WB	Wet bulb
WC	Water closet
WH	Wall hydrant OR Water heater
WO	Waste oil
<hr/>	
XFMR	Transformer
<hr/>	
YD.	Yard
YH	Yard hydrant

END OF SECTION 220500



## SECTION 220503 - PLUMBING LUBRICATION AND PACKING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Contractor shall lubricate all the equipment that it furnishes with the correct grade, type, and quantity of lubrication before placing equipment and valves in service.

#### 1.03 QUALITY ASSURANCE

- A. Follow Equipment Manufacturer's recommendations for specific lubricants and application schedule.

#### 1.04 SUBMITTALS

- A. Incorporate lubrication instructions in Operating and Maintenance Manual.

### PART 2 PRODUCTS

#### 2.01 LUBRICANTS

- A. Refer to Manufacturer's recommended lubricants. Furnish equal lubricants as supplied by Castrol, Mobil, Shell or the Owner's present supplier.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Each shaft or valve stem containing a packing gland shall be checked for condition and examined for proper packing.
- B. Maintain lubrication and packing seals during construction and ensure that, at the time of final acceptance, all are operating properly.
- C. When filling systems initially for hydrostatic pressure tests, adjust valve packing glands to finger-tight and allow packing to absorb water for 5 minutes prior to tightening packing nuts.
- D. Contractor shall repair any damage caused by improper lubrication of the equipment that it furnished, at no expense to the Owner.

END OF SECTION 220503





SECTION 220505 - PLUMBING EXCAVATION AND BACKFILL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 00, "Common Work Results for Plumbing," Part 3, "Cutting and Patching."
- B. Section 32 12 16, "Asphalt Paving"

1.03 DESCRIPTION

- A. The bedding and backfill requirements listed in this Section represent a minimum requirement. If Local or State requirements are in excess of listed requirements, such requirements shall supersede.
- B. ALL EXCAVATION AND BACKFILL WORK SHALL COMPLY WITH REQUIREMENTS OF THE LATEST STANDARDS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).
- C. Provide excavation and backfilling for Plumbing Work. Backfill to finish grade or to levels suitable for finish grading.
- D. Refer to Section 22 05 00 for cutting and patching responsibilities.
- E. Coordinate routing of underground lines with the A/E to minimize disruption and damage to trees, shrubs, walks, drives, and other landscape features.
- F. Excavation, backfill, surface repair and traffic control within the public right-of-way shall be in accordance with governing agency rules and regulations. Pay any fee associated with alteration of the roadway.
- G. Remove unusable or surplus excavated material from the site. Deposit any usable excavated material where directed by the A/E.
- H. Locate and touch existing underground utilities, if any, in the areas of Work. If utilities are to remain in place, provide adequate means of protection during earthwork operations. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, notify the A/E immediately for instructions before proceeding. Cooperate with all trades, Utility Companies and the Owner in keeping services and the facilities in operation.
- I. Excavation damage to, or interruption of service of, any underground utility shall be a liability of the Contractor, whether or not plotted on the Drawings. Promptly repair or replace all damage to any existing utility to the full satisfaction of the Utility Company, the Utility Owner and the A/E.
- J. All existing utility service piping, conduits, wiring, etc., which are uncovered, whether within or beyond the property lines, shall be suitably supported, protected and maintained in operation, and shall be protected against settlement when excavations are refilled.
- K. Coordinate timing of excavations where required by the Authority Having Jurisdiction or where otherwise specified herein.
- L. Provide pipe bedding for all sanitary sewer lines located outside of building.
- M. Provide pipe bedding for all sanitary sewer lines located below the floor slab.

- N. Obtain approval from the A/E for bearing conditions.
- O. Whenever, in the opinion of the A/E, the soil is unsuitable for supporting piping, provisions for proper foundations will be made and the Contract price will be adjusted accordingly.
- P. Contact the A/E to obtain copies of Soils reports, if available. Bidders are strongly urged to visit the site and investigate existing soil conditions themselves.
- Q. 11 months after Contract Completion, review the excavated areas and add any backfill as directed by A/E or owner due to settling, etc. Re-seed or re-sod.
- R. Contractor shall provide seed grass cover to reestablish landscape to existing conditions where disturbed by its Work. This includes replacement of existing plants, shrubs, and related items.
- S. Repair and restore plants, shrubs, trees, sodden areas, paving, streets, curbs, and walks to match existing in the area where excavations are made.
- T. Maintain seeded lawns not less than 11 months after Contract Completion and add any backfill as directed by A/E or owner due to settling, etc. If seeded in non-growing season and not given full 11 months of maintenance, or if not considered acceptable at that time, continue the following growing season until an acceptable lawn is established, as determined by the A/E or owner.
- U. Rock excavation is not anticipated. Contractor will be entitled to additional compensation for excavating any rock that is not indicated on the Contract Drawings or in available Soils Reports. Refer to available soil boring data.
  - 1. If rock or boulders are encountered, immediately stop all excavation. Notify the A/E, and submit a cost per cubic yard, over and above Base Bid, for excavation and backfill of rock areas. Rock excavation is defined as the excavation of any buried boulders and rock, in excess of 1/2 cu. yd. in volume, which requires the systematic drilling with jackhammer or use of other special equipment.
  - 2. All other excavation, including soft shale and similar sedimentary soil formations, shall be regarded as "earth" excavation, and shall be included in the Contractor's Bid.
  - 3. Do not proceed with rock excavation without prior written authorization of the A/E.
  - 4. The use of explosives is expressly prohibited.

#### 1.04 REFERENCE DATUM

- A. All dimensions or elevations are relative to finished grade (not existing grade).

#### 1.05 EXISTING SOIL CONDITIONS

- A. Refer to Soils Report.

#### 1.06 QUALITY ASSURANCE

- A. Standards:
  - 1. Ohio Department of Transportation (ODOT), "Construction and Material Specifications."
  - 2. State and Local requirements.
  - 3. OSHA requirements.
  - 4. American Concrete Institute (ACI).

#### 1.07 CONCRETE ENCASEMENT

- A. Provide concrete encasement required for underground piping. Where required, concrete encasement shall extend 6 in. around piping or sleeve, for 1 ft. each side of footings or foundations, and up to footing bearing elevation. Backfill around piping encasement after concrete has properly hardened. See section 2.01 for where encasing is required.

- B. *All concrete shall be 3,000 PSI minimum and placed in accordance with applicable ACI Standards. Refer to Section 03 30 00.*

## PART 2 PRODUCTS

### 2.01 BACKFILL

- A. Typical backfill conditions:
1. Piping where bedding is not specified or required by Code: Previously excavated material.
  2. Piping below slab-on-grade floors and pavement: Crushed stone (ODOT Item 304), pea gravel, or coarse sand from 4 in. below piping to slab.
  3. Other piping outside building: Pea gravel from 4 in. below piping to 12 in. minimum above pipe, then previously excavated material.
  4. Piping under drives and parking lots: Pea gravel from 4 in. below piping to 12 in. minimum above pipe, then previously excavated material. If pipe is less than 2 ft. below grade to top of pipe, provide 6 in. concrete encasement.
  5. Concrete pads and bases: Granular material conforming to Division 02 requirements.
  6. Piping under footings and foundations: Provide concrete encasement.
  7. Underground oil interceptor: Pea gravel.
- B. Materials:
1. Crushed stone: (ODOT Item 304).
  2. Pea gravel: 1/8 in. minimum to 3/4 in. maximum diameter.
  3. Sand: Clean, dry, coarse or medium.
  4. Washed gravel: 3/4 in. size.
  5. Concrete encasement: Material conforming to Division 03 requirements.
- C. Materials Prohibited from Being Used for Backfill:
1. Material containing large rocks (over 2 in.), building materials, masonry debris, cinders, rubbish, wood, or other material subject to decay.
  2. Any material which may cause damage to piping.
  3. Frozen earth.

### 2.02 PAVING

- A. Asphalt Paving:
1. Aggregate base: ODOT Item 304, refer to section 32 12 16 Asphalt Paving for thickness.
  2. Base course: ODOT Item 402, refer to section 32 12 16 Asphalt Paving for thickness.
  3. Surface course: ODOT Item 404, refer to section 32 12 16 Asphalt Paving for thickness.
  4. Tack coat: ODOT Item 407.
  5. Prime coat: ODOT Item 408.
- B. Sealer: ODOT Item 409.

## PART 3 EXECUTION

### 3.01 EXCAVATION

- A. Excavations shall be open-cut from the surface. No undercuts will be permitted, except where specifically directed by the A/E.
- B. Place no backfill until underground lines have been tested. Compact backfill in 6 in. deep layers. Mark location of trenches and lines on Record Drawings.
- C. Hold trench width to a minimum.

- D. Do not excavate utility trenches parallel to building, or column footings, closer than 5 ft., except with prior written approval of the A/E. When parallel trenches deeper than the building footings are required, the horizontal distance from the footing shall be equal to, or greater than, 1-1/2 times the vertical distance below the footing, but in no case shall the horizontal distance be less than 5 ft., except with the written approval of the A/E.
- E. Bedded piping: Mechanical excavation shall extend 4 in. to 6 in. below final elevation of pipe.
- F. Unbedded piping: Mechanical excavation shall be held to 4 in. above final elevation. The remainder shall be trenched by manual excavation, so that piping is fully supported on undisturbed soil. SHORING OF PIPING IN TRENCH WILL NOT BE PERMITTED.
- G. Whenever the soil is found unsuitable for supporting piping, provide proper foundation after receiving written approval of the A/E.
- H. Remove, from site, excess materials unsuitable for fill.
- I. Coordinate timing of excavations in advance with all trades, the A/E and the Owner.

### 3.02 PROTECTION

- A. Maintain in place adequate barricades, guards, planking, plating, signage, warning lights, etc., at and around excavations.
- B. Contact the Ohio Utilities Protection Service (1-800-362-2764) well in advance of the start of any excavation to determine if any of the Utility Companies have underground utilities in, or near, the project area.
- C. Contact the Owner and the Local Water and Sewer Department, Gas Company, Electric Company, Telephone Company, etc., regarding the possibility of encountering existing utilities. Maintain the integrity of all existing utilities.
- D. Protect existing utilities encountered during excavation work in a manner acceptable to the Utility Owner. Contractor shall promptly repair or replace, at its expense, all damage to any existing utility to the full satisfaction of the Utility Company, the Utility Owner and the A/E.
- E. Provide and maintain bracing, shoring, and sheet piling or sheathing to safely support walls of the excavation. Barricade and maintain in a safe condition until backfilling is completed.
- F. Provide and operate pumping equipment to keep excavation free of water at all times.
- G. Protect excavations from frost by covering and heating .
- H. During backfilling of outside piping, install a continuous 4 in. wide vinyl plastic tape, with embossing, identifying buried service, 18 in. above pipe elevation on pipe centerline. Tape shall be manufactured by Seton, Brady, MSI or Calpico.

### 3.03 BACKFILLING

- A. Backfill only when exact locations of lines and equipment have been recorded, and all tests and inspections have been completed.
- B. Do not place fill material on frozen ground or use fill in a frozen condition.
- C. Deposit fill in layers of thickness required by the nature of the soil, or as directed, but not exceeding 6 in. compacted thickness, to a point 24 in. above pipe, and 12 in. thickness above this point. Compact each layer to a uniform solid mass. Place fill in horizontal layers, beginning with lowest areas and building up until entire area to be filled is at a uniform elevation. Compaction shall be a minimum of 90 lbs. per cu. ft., laboratory dry weight.

- D. Bedded piping: Bed pipes in pea gravel, minimum 4 in. below pipe, 6 in. above pipe, according to Ohio Specifications CM 310.02, Grading "A."
- E. Unbedded Piping: If excavation should go deeper than required, fill with bank run gravel and tamp firmly to achieve final elevation. Wherever material is encountered in the bottom of the excavation that is not capable of supporting piping properly, remove such material to depth required. Backfill with crushed stone, and tamp firmly to achieve final elevation.
- F. Control moisture content of compacted fill to ensure maximum density by adding water and working soil prior to compacting.
- G. Use machine tampers around perimeter of foundation walls or areas inaccessible to large equipment and rollers. Do not use rolling equipment in areas adjacent to foundations.
- H. Where excavations have not been properly filled or where settlement occurs, refill, compact, smooth off, and finish excavations to a final condition acceptable to the Owner and A/E.

### 3.04 EXCAVATION SAFETY

- A. Contractor shall be solely responsible for construction means, methods, techniques, sequences, procedures, or safety precautions and programs in connection with this Work. The Owner A/E will not be responsible for the Contractor's failure to employ proper safety procedures.
- B. Excavation and trench wall supporting, shoring, sloping, cribbing, stepping of excavations, and other steps required for safety shall be in strict accordance with OSHA and Local Code requirements.
- C. Slope sides of excavations to comply with requirements of OSHA and Code Authority having Jurisdiction. Shore and brace where sloping is not possible because of space restrictions or instability of material exposed.
- D. Maintain sides and slope of all excavations in a safe condition, until completion of backfilling.
- E. Minimize time trenches are kept open. Fill as soon as possible.
- F. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
- G. Barricade open excavations occurring as part of this Work, and post with warning lights. Erect warning lights as required by OSHA and Code Authority having Jurisdiction. Consult with the A/E regarding additional requirements.
- H. Protect existing structures that are to remain, such as utilities, sidewalks, pavements, and other facilities, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- I. Refer to the "Manual of Accident Prevention in Construction," published by the Associated General Contractors of America, and to the safety regulations of the appropriate State Agency.

END OF SECTION 220505



## SECTION 220506 - PLUMBING SUBMITTALS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.
- B. All submittals shall adhere to section 013300. In the case of conflicts, the more restrictive shall apply.

#### 1.02 DESCRIPTION

- A. Transmittal form: Use State of Ohio Shop Drawing Transmittal form.
- B. Materials and equipment installed under the Plumbing Contract shall meet all the requirements of the Contract Documents, and no materials or equipment shall be ordered or installed until submittals are reviewed and approved by the A/E.
- C. Refer to the following Sections for additional plumbing items that the Contractor shall submit:
  - 1. Division 23, "Heating, Ventilating, and Air Conditioning," Section 23 11 23, "Facility Natural-Gas Piping."
  - 2. Division 33, "Utilities":
    - a. Section 33 51 00, "Natural-Gas Distribution."
    - b. Section 33 56 13, "Aboveground Fuel-Storage Tanks."
- D. Submit complete copies of the catalog data or shop drawings for each manufactured item of equipment and all components to be used in the Work, including the following:
  - 1. Brand name.
  - 2. Catalog number.
  - 3. Specific performance data.
  - 4. Material description.
  - 5. Ratings.
  - 6. Capacity.
  - 7. Working pressure.
  - 8. Dimensional data.
  - 9. Material gauge or thickness.
  - 10. Wiring diagrams.
  - 11. General type.
- E. Catalog data for equipment reviewed by the A/E shall not take precedence over the requirements of the Contract Documents. Review by the A/E shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with all trades.
- F. When submitted for review, all shop drawings shall bear the Contractor's signed certification of the following:
  - 1. Contractor has reviewed, checked, and approved the shop drawings.
  - 2. Shop drawings have been coordinated with the requirements of the Project and with the provisions of the Contract Documents.
  - 3. Contractor has verified all field measurements, hands of equipment, and construction criteria, materials, catalog numbers, and similar data.



- G. It is understood that the A/E's review is ONLY for conformance with the design concept of the Project and with the Contract Documents and, further, that the A/E is not responsible for the means, methods, sequences, techniques, or procedures of construction, or for safety precautions and programs incidental thereto.

1.03 SHOP DRAWINGS

- A. Indicate arrangement of component parts, physical dimensions, materials, electrical and mechanical service requirements, colors (where required), controls, accessories, capacities, and performance characteristics.
- B. Prior to submitting shop drawings, the Contractor shall stamp and sign its certification that the equipment shown on the submittals meets all the requirements of the Contract Documents. **UNSIGNED COPIES WILL NOT BE REVIEWED.**
- C. Submit (8) copies, unless otherwise noted. Approved shop drawings shall be distributed as follows:

QUANTITY	TO
1	A/E
2	Contractor
2	Supplier
3	Operating and Maintenance Manuals

1.04 CONTRACTOR RESPONSIBILITIES

- A. Completely review Shop Drawings, product data, and samples prior to submission.
- B. Determine and verify the following:
  - 1. Field measurements.
  - 2. Field construction criteria.
  - 3. Catalog numbers and similar data.
  - 4. Conformance with Specifications.
  - 5. Hand of equipment.
  - 6. Quantities and sizes.
- C. Coordinate each submittal with requirements of the Work and the Contract Documents.
- D. Notify the A/E, in writing, at time of submission, of any deviations in the submittals from the requirements of the Contract Documents.
- E. Contractor shall make submittals promptly in accordance with the approved schedule, and in such sequence as to cause no delay either in its Work or in the work of any other trades.
- F. Immediately make any corrections or changes in rejected submittals as required by the A/E and resubmit until accepted.
- G. If the Contractor orders equipment or materials, or begins installation, fabrication, or work prior to return of approved submittals, it shall be "at the Contractor's own risk."
- H. When (2) or more articles of the same material or equipment are required, they shall be of the same Manufacturer.
- I. Incorporate Shop Drawings into the Operating and Maintenance Manuals.

1.05 CERTIFICATIONS

- A. Provide:
  1. Test Agency results verifying capacities, operating conditions, and power requirements at design conditions.
  2. Manufacturer’s statement of compliance with Standards discussed in individual Specification Sections.
  3. Equipment labels indicating Certification requirements.
  4. Quality standard designations on each unit piece, e.g., each pipe length, pressure vessel, or valve.
  5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with.
  6. Other Certifications listed in other Sections of the Specifications.

1.06 REQUIRED SUBMITTAL INFORMATION

- A. The items listed below may not be a complete list of required submittals. Submit for approval all items to be provided, whether listed or not.

KEY FOR REQUIRED SUBMITTALS

- A Catalog Cuts/Shop Drawings (8 copies).
- B Operating and Maintenance Manuals (3 copies).
- C Color samples (3 each).
- D Product samples (2 each).
- E Typed statement of material to be furnished.
- F Typed verification of compliance with certification requirements.
- G Test.
- H Coordination Drawings.

(Submit number of copies indicated. If not indicated, submit full quantity of copies previously listed.)

PLUMBING SUBMITTALS REQUIRED	KEY
Water Closets .....	A
Urinals.....	A
Flush Valves .....	A
Lavatories .....	A
Lavatory/Sink Faucets .....	A
Sinks.....	A
Mop Service Basin and Accessories.....	A
Wash Fountains .....	A, C
Shower Faucets .....	A
Electric Water Coolers.....	A, C
Food Waste Grinder.....	A
Water Closet Carriers.....	A
Urinal Carriers .....	A
Electric Water Cooler Carriers .....	A
Water Closet Seats.....	A
Lavatory/Sink Traps .....	A
Floor Drains .....	A
Trap Primers .....	A
Cleanouts .....	A
Exterior Cleanouts .....	A

Oil Interceptor.....	A
Valves .....	A
Yard Hydrants.....	A
Wall Hydrants .....	A
Hose Bibbs.....	A
Vacuum Breakers.....	A
Thermometers .....	A
Pressure Gauges.....	A
Gauge Cocks.....	A
Shock Absorbers .....	A
Backflow Preventer, Main Line.....	A
Backflow Preventers, Branch Lines.....	A
Backflow Preventers, Equipment .....	A
Backflow Preventers, Vending Equipment.....	A
Air Gap Fittings .....	A
Strainers .....	A
Water Heater .....	A
Compressed Air System Components .....	A
Air Compressor.....	A
Refrigerated Air Dryer.....	A
Lubrication System Components.....	A
Waste Oil Tank .....	A
Fuel Tank/Dispensers (Alt. P-1) .....	A
Fuel Equipment and Accessories (Alt. P-1).....	A
Oil System Components .....	A
Waste Oil Storage Tank.....	A
Isolators.....	A
Hangers .....	A
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END OF SECTION 220506

## SECTION 220507 - PLUMBING OPERATING AND MAINTENANCE MANUALS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 01 77 00, "Closeout Procedures."
- B. Section 22 05 60, "Requirements for Completion of Plumbing Work."

#### 1.03 DESCRIPTION

- A. Compile Operating and Maintenance Manual upon completion of the Work, and as required for final acceptance. Submit draft of Operating and Maintenance Manual to the A/E for review and approval (30) days before Contract Completion.
- B. Submit final corrected Operating and Maintenance Manual 7 days before Contract Completion.
- C. Upon approval, provide (3) Operating and Maintenance Manuals.

### PART 2 PRODUCTS

#### 2.01 OPERATING AND MAINTENANCE MANUALS

- A. The following items, together with any other pertinent data, shall be included in each Operating and Maintenance Manual. This list is not necessarily complete and shall be used only as a guide. Format of manual to be as follows:
  - 1. Operating and Maintenance Manuals shall be loose-leaf, 3-ring, hardcover binders, no larger than 11 in. wide x 12 in. high. Material shall be typewritten or printed in English, and be fully legible. Each section shall be divided by labeled tabs.
  - 2. Cover:
    - a. Title of Project.
    - b. Date of Project completion.
    - c. Name and address of the Owner.
    - d. Date of submittal.
    - e. Name, postal and email addresses, telephone and fax numbers of the Contractor.
    - f. Name, postal and email addresses, telephone and fax numbers of the A/E.
  - 3. Second Page: Index.
  - 4. First Section: A copy of each shop drawing and approval submittal with an index at the beginning of the section.
  - 5. Second Section:
    - a. A list of all equipment used on the job.
    - b. Parts list with numbers of replaceable items, including sources of supply.
    - c. Manufacturers', nearest Supply Houses' and Factory Representatives' names, postal and email addresses, telephone and fax numbers.
    - d. Model and Serial numbers of components of systems installed.
    - e. Routine and 24-hour emergency service/repair information:
      - 1) Name, postal and email addresses, telephone and fax numbers of servicing agency.

- 2) Names of personnel to be contacted for service arrangements.
6. Third Section:
- a. Description of systems.
  - b. Manufacturer's literature describing each piece of equipment, including the following:
    - 1) Operating and maintenance instructions.
    - 2) Lubrication instructions.
    - 3) Start-up and shutdown procedures.
    - 4) Routine and emergency servicing instructions.
  - c. Valve charts.
  - d. Special wrenches, keys, etc.
  - e. Copies of all testing and balancing reports.
  - f. Prints of all system wiring and control diagrams.
  - g. All certifications and related information.
  - h. Copies of all written warranties.
  - i. The Owner's receipt of spare parts. Refer to Section 22 05 60.
  - j. Copy of the signed and dated letter from the Owner, stating satisfactory completion of instruction, listing names of personnel instructed, and listing names of persons giving the instruction.
- B. Refer to Section 01 77 00 for additional requirements.

END OF SECTION 220507

## SECTION 220508 - PLUMBING ELECTRICAL COORDINATION

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 26 05 11, "Equipment Hook-Up and Final Connection."
- B. Section 26 05 19, "Low-Voltage Electrical Power Conductors and Cables."
- C. Section 26 05 33, "Raceway and Boxes for Electrical Systems."
- D. Section 26 09 00, "Instrumentation and Control for Electrical Systems."

#### 1.03 DESCRIPTION

- A. This contract is single prime therefore all coordination between trades is done by the prime contractor. This specification may be used as a guide for the single prime contractor.

#### 1.04 ALTERNATIVE MANUFACTURER ELECTRICAL REQUIREMENTS

- A. Contractor furnishing the equipment shall compensate the Electrical Contractor for the cost of any additional labor and materials required to wire and hook up equipment other than the Design Base Model and Manufacturer.

#### 1.05 COORDINATION

- A. Plumbing Contractor shall coordinate its Work as follows:
  - 1. **PLUMBING ITEMS:**
    - a. Electric Water Coolers: Plumbing Contractor shall coordinate location and electrical requirements with the Electrical Contractor. Electrical Contractor shall provide receptacle and wiring. Plumbing Contractor shall provide electric water cooler with cord and plug, and shall plug-in.
    - b. Domestic Water Heaters: Plumbing Contractor shall coordinate location and electrical requirements with the Electrical Contractor. Electrical Contractor shall provide disconnect switches/or plug and wiring.
    - c. Food Waste Grinder: Electrical Contractor shall provide wall switch and wiring.
    - d. Air Compressor: Shall include a motor starter. Electrical Contractor shall provide disconnect switch and wiring, and wall mounted pilot light switch.
    - e. Refrigerated Air Dryer: Plumbing Contractor shall provide refrigerated air dryer with cord and plug, and shall plug-in. Electrical Contractor shall provide receptacle and wiring.

#### 1.06 QUALITY ASSURANCE

- A. Standards:
  - 1. All electrical equipment shall be listed by Underwriters Laboratories, Inc. (UL) and furnished in accordance with Specification requirements of Division 26, "Electrical." Installation shall comply with 2014 National Electrical Code (NEC).
  - 2. National Electrical Manufacturers Association (NEMA).

## PART 2 PRODUCTS

### 2.01 CONTROL WIRING

- A. Electrical Contractor shall provide all control wiring.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Consult Drawings that may affect location of equipment, conduit, or wiring, and make minor adjustments in locations as necessary to secure coordination.

### 3.02 INSTALLATION

- A. Plumbing Contractor shall coordinate all wiring requirements with the Electrical Contractor.
- B. Plumbing Contractor shall provide the Electrical Contractor with all required wiring diagrams for equipment furnished under the Plumbing Contract.
- C. Plumbing Contractor shall assist in check-out and start-up operations.
- D. On all starters provided by the Plumbing Contractor, if motor starter element's designated amperage is more than 110% of the full load current after balancing, the Plumbing Contractor shall provide starter elements.
- E. Plumbing Contractor is responsible for the final operation of all equipment provided under its Work.

### 3.03 WIRING

- A. Electrical Contractor shall provide all power and line voltage control wiring, and conduit, regardless of voltage. This work includes, but is not limited to, control wiring for plumbing equipment.
- B. Electrical Contractor shall run all wiring in conduit. EXCEPTION: Wiring operating at voltages less than 30 volts can be run exposed above accessible ceilings. NOTE: All wiring and cables installed in air handling plenums either shall be UL 910-listed, Teflon-coated, with plenum rated ties, or shall be run entirely in conduit.
- C. Low voltage wiring may be run exposed ONLY above accessible lay-in ceilings. Wiring shall be run neatly; perpendicular to walls; away from piping or other construction likely to damage the insulation; and securely clipped or fastened directly to the building structure or supported with bridle rings. Unless otherwise noted, all low voltage wiring shall be installed in conduit at the following locations:
  - 1. Where wiring rises up inside walls.
  - 2. Where wiring is run below floor slab.
  - 3. Where wiring is run through or above inaccessible ceilings or in chases.
  - 4. Where wiring is run below ceilings or in equipment rooms.
  - 5. Where run exposed.
- D. Comply with Section 26 05 19 for all wiring, and with Section 26 05 33 for all conduit.
- E. Wiring installation shall be acceptable to the Code Authority Having Jurisdiction.

END OF SECTION 220508

## SECTION 220509 - GENERAL PLUMBING PIPING REQUIREMENTS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. The following instructions apply to all piping systems, except where otherwise noted:
  - 1. Piping Drawings are schematic. Carefully coordinate final locations.
  - 2. Provide unions or flanges at each final connection and at each piece of equipment. Arrange piping, and locate unions and flanges, to permit easy removal of parts and equipment for inspection and cleaning. Welded connections to equipment are prohibited.
  - 3. Make connections to equipment as recommended by the Manufacturer or as detailed on the Drawings.
  - 4. Where connection size is smaller than piping, make reduction at final connection only. Do not reduce size of pipe drop. Arrange all piping in accordance with the best standards of the Trade, with vertical lines plumb, and horizontal runs parallel or perpendicular to the building walls.
  - 5. Provide valves and specialties as directed by A/E and/or owner for ease of maintenance and as shown on drawings. Install valves on each piece of equipment.
- B. Clean out and flush water piping systems.
- C. If other means of draining are not provided, install drain valves at all low points to permit complete draining of each of the following systems:
  - 1. Domestic water system.
  - 2. Compressed air system.
- D. Contractor shall provide information on chases, sleeves, and openings required for its Work to other trades. Contractor shall assume cost and responsibility for all cutting and patching resulting from improper coordination of its Work.
- E. Welded pressure piping shall be installed by a qualified welder certified in accordance with Chapter 4101.8 of the Ohio Building Code. Welds shall be stamped at each joint or fitting.
- F. Provide pipe boots, flash into roof construction, and make watertight.
- G. Coordinate all locations and sizes of roof penetrations for the Plumbing Work.
- H. Provide pipe openings through roof, provide flashing, and "roof in," making absolutely watertight after piping is in place.

### PART 2 PRODUCTS

#### 2.01 UNIONS

- A. In copper pipe: Bronze 150 lb. ground joint, solder end (do not use wrought copper unions).
  - 1. Acceptable Manufacturers: EpcO, Rockwell, Mueller, Chase, Crane, Dart, Flag, or Nibco.
- B. In steel pipe: Black malleable iron, 250 lb. bronze ground ball joint.
  - 1. Acceptable Manufacturers: Mueller, Chase, Crane, EpcO, Fairbanks, Grinnell, or Stockham.



- C. Dielectric: Material shall be compatible for the type of service.
  - 1. Acceptable Manufacturers: Epco, Capitol, Dart, Watts, or Vogt.

## 2.02 DRAIN VALVES

- A. Drain Valves: Milwaukee BA-100H or BA150H. 3/4 in. bronze hose-end ball valve, with cap and chain (where concealed).
- B. Other Acceptable Manufacturers: Approved equal by Walworth or Nibco.

## 2.03 JOINTS

- A. Flanged: Cast iron or cast bronze, 125 lb. or higher as required by operating pressure.
  - 1. Acceptable Manufacturers for dielectric flange and bolt isolators: Capitol, Crane, Dart, Epco, or Vogt.
- B. Gaskets: Nonmetallic. 1/8 in. minimum thickness, fibrous type with double coat of graphite, asbestos-free, ASME B16.21, except use Type 304 stainless steel with carbon steel guide on high temperature piping systems. Use dielectric gaskets where joining dissimilar piping material.
- C. Bolts and Other Hardware:
  - 1. Bolts for steel, cast iron, brass, and bronze, for 250 lb. SWP, and for 450 deg. F. or below: Carbon steel, with American Standard regular, square heads and American Standard heavy-hexagon, semi-finished nuts.
  - 2. Where equipment is installed outside, all hardware and bolts shall be stainless steel.
  - 3. ASME B18.21, Tee-head, high tensile steel bolts and nuts may be used in mechanical joint pipelines.
- D. Threaded piping: Use NPT tapered threads. (ASME B1.20.1.)
- E. Filler materials:
  - 1. Solder: Shall meet ASTM B32. Alloy Sn94 and Sn95 shall be used.
  - 2. Brazing: Shall meet AWS A5.8.
  - 3. Welding: Shall comply with AWS D10.12.

## 2.04 NIPPLES

- A. Same weight and material as pipe with which they are used, except shoulder nipples shall be extra-heavy. Short nipples are not allowed.

## 2.05 PIPING SPECIALTIES

- A. Provide specialties as required in other Sections of these Specifications.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Provide union or flange in final piping connection to each device or item of equipment, and elsewhere, to make-up or disconnect piping. Each union or flange shall be installed to permit removal of parts and equipment, and in a position permitting the device or equipment to be removed without disconnecting piping beyond the union or flange. Install union adjacent to each threaded valve.
- B. Make reductions in piping lines with reducing couplings or weld fitting reducers.
- C. Install piping so as to provide clearance for personnel passage, headroom, operation of doors or windows, equipment, electrical panels, lighting, and electrical outlets, or with the Owner's apparatus and equipment. Coordinate pipe runs and elevations with all trades before installation.

- Where interferences develop in field, pipes may need to be offset or rerouted to resolve interferences.
- D. Provide offsets in system piping runs, additional fittings, necessary drains and valves, and devices required to complete the installation, or for the proper operation of the system. Exercise due and particular caution to determine that all parts of the work are quickly and easily accessible.
  - E. In pipe spaces to be entered for servicing, piping shall be offset so that, where possible, all lateral runs are located either near floor or 6 ft.-0 in. or higher above floor, and all vertical piping is held close to the wall through that height to permit access. Keep all piping to side of chases wherever possible. Offset vents immediately above connection to waste line.
  - F. Piping or flue vent shall not be installed over electrical panels, switchgear, or equipment, or within or over required clearance spaces described in 2008 NEC Articles 110 and 408.
  - G. Install pipes, valves, fittings, etc. requiring insulation with a minimum of 1/2 in. clearance between the finished covering and other work and between the finished covering of parallel, adjacent pipes.
  - H. Make changes in pipeline direction with fittings. Do not bend or spring piping.
  - I. Offset lines around columns, beams, and other obstructions as required for installation. Where special conditions are encountered in field, the A/E shall decide arrangement and alignment of piping.
  - J. At time of erection, clean piping components of loose material. After erection, and prior to putting in service, blow or flush lines free of loose materials. Clean strainer screens and sediment pockets prior to putting lines in service.
  - K. Install valves at service connections to equipment not provided with valves, and at branch lines from main lines.
  - L. Install all valves and unions so as to be accessible through a removable ceiling, or ceiling or wall access panels.
  - M. Isolate direct contact between pipe, fittings, flanges, and hangers or dissimilar metal by use of dielectric unions, shims, gaskets, coatings, or other approved methods.
  - N. Install and adjust thermometers and gauges to permit them to be read from floor level.
  - O. Install backflow preventers and thermostatic mixing valves so as to be easily accessible, and at a maximum of 9 ft. above the floor.
  - P. Securely support all piping from structure with approved hangers, rods, brackets, and accessories.
  - Q. Where piping is installed in masonry block walls, coordinate with the structure so piping enters the wall at a masonry joint wherever possible.
  - R. Bullhead connections are not allowed.
  - S. Where exposed pipes pass through walls, floors, or ceilings of finished rooms, provide chrome-plated escutcheons. Prime-coated black iron escutcheons may be used in unfinished rooms. Protect escutcheons from tool marks.
  - T. Keep piping level, except where a slope is required. Use eccentric reducers to keep top of pipe level.
  - U. Avoid trapping of piping.
  - V. Install a 3/8 in. ball valve at each pressure gauge and air vent.
  - W. Protect all piping, fittings, and valves from excessive tool marks.

- X. Cut pipe accurately, and work into place without forcing or springing.
- Y. Remove burrs to full inside diameter of pipe by reaming.
- Z. Conceal all pipes, except in equipment rooms, in rooms without ceilings, or where specifically directed otherwise.
- AA. Install piping parallel to building walls, except where specifically shown otherwise.
- BB. Install all piping in a neat and workmanlike manner.
- CC. At the end of each day's work, provide caps and/or plugs at all openings in installed piping for protection. Prevent the possibility of ANY foreign materials entering piping.
- DD. Install dielectric unions or dielectric flanges on all connections between copper tubing and steel pipe and between copper tubing and equipment having ferrous metal connection.
- EE. Where any system piping runs or components are so placed as to cause or contribute to a conflict, they shall be rerouted and readjusted at the expense of the Contractor causing the conflict. Where a conflict arises, the A/E's decision shall be final in regard to the arrangement of equipment, ductwork, piping, etc.
- FF. Piping containing fluids subject to freezing shall not be installed in exterior walls, regardless of wall insulation location. Piping subject to freezing may be installed in unheated ceiling spaces only where specifically shown, immediately above the ceiling of a heated space, with building insulation closely packed above the piping to protect it from freezing. Contractor providing the piping shall ensure that vulnerable piping is protected against freezing.

### 3.02 WELDED CONNECTIONS

- A. Welded joints shall be fabricated and stamped by welders qualified and certified as required by the Code Authority having Jurisdiction.
- B. Butt-weld joints shall have substantially full penetration and recommended bead reinforcement.
- C. Slip on, socket, and fillet welds shall have geometry indicated in the "Code for Power Piping" (ANSI B31.1).
- D. Remove weld scale from joints as work proceeds, and at completion.

### 3.03 SOLDERED AND BRAZED CONNECTIONS

- A. Joints shall have pipe or tubing end reamed to full inside diameter after cutting.
- B. Exterior of joint shall be smooth.
- C. Clean with steel wool.
- D. Apply flux to prevent oxidation.
- E. Apply solder or brazing filler material, and thoroughly heat to completely melt material and cause it to migrate completely over the mating surfaces.
- F. Solder and brazing work shall comply with ANSI B31.1.
- G. 100% lead-free solder shall be used on domestic water piping, joints, and fittings.

### 3.04 THREADED CONNECTIONS

- A. Ream pipe ends at threads to full cross-sectional area after cutting. Threads shall conform to ASME B1.20.1.

- B. Joints shall be made with TFE tape, applied to male threads only. OPTION: Use Permatex pipe dope.

### 3.05 FLANGED CONNECTIONS

- A. Flanged joints shall be faced, square, and true. Install gaskets suitable for the operating temperature and pressure of the fluid or gaseous medium being piped.

### 3.06 PIPE CLEANING

- A. Provide a temporary inline pump for cleaning and flushing of piping system. Flush out water piping systems to remove dirt and grease from pipes and equipment. Clean strainers after each flushing until they remain clean.

### 3.07 PIPING PROHIBITIONS

- A. Do not run piping across, in front of, or below windows, skylights, door openings, access panels, or lighting fixtures. Do not run piping over, or within 36 in. in front of, electrical switchgear or panels. Obtain instructions from the A/E if a conflict occurs.
- B. Do not run piping in, or above, the access space in the immediate vicinity of electrical switchgear, electrical panels, or other electrical equipment, in accordance with 2014 NEC Article 408. Where this is not possible, if approved in writing by the A/E, provide a sheet metal drip pan under piping to prevent water and condensate from running or dripping down on the electrical equipment, at no additional cost to the Owner.
- C. Sanitary and vent lines shall be continuously sloped; trapping is expressly prohibited.

END OF SECTION 220509



## SECTION 220510 - PLUMBING PIPING EXPANSION, NOISE, AND VIBRATION ISOLATION

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 12, "Plumbing Vibration Isolators."

#### 1.03 DESCRIPTION

- A. Provide thermal expansion control for all piping.
- B. Isolate all piping for both noise and vibration transmission.
- C. To prevent damage to building, equipment, joists, hangers and piping, provide expansion loops, guides, anchors and offsets in piping systems as necessary to accurately control pipe movement due to equipment operation or thermal gradients.
- D. Provide flexible connectors on all piping to equipment 5 HP and larger, and where shown for equipment of lower horsepower.
- E. Provide expansion joints and accompanying anchors and guides where expansion cannot be provided for with loops and offsets (not shown).
- F. Anchor points are not indicated on Drawings. Install anchor points as needed to properly control piping movement. Typically piping shall be anchored at tees, elbows and bends. Piping shall also be anchored in each direction.

#### 1.04 ACCEPTABLE MANUFACTURERS

- A. Metraflex Company or approved equal by Hyspan Precision Products, Inc., Flexicraft, Flexonics Products, Minnesota Flexible Corp., Uniroyal General Rubber, or Twin City Hose, Inc.
- B. Manufacturer and Model Number listed under Part 2 shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

### PART 2 PRODUCTS

#### 2.01 EXPANSION JOINTS

- A. Stainless steel bellows and elements; cast iron equalizing rings, tie-rods, and pipe connections ; 250 PSIG working pressure. Use packless, internally guided type for lines 2 in. and smaller. See item 1.04, A, in this specification section for approved equal manufacturers.
- B. 2 in. and Smaller Lines: Metraflex HPMF. Stainless steel with copper sweat ends, packless, internally guided expansion compensator type. See item 1.04, A, in this specification section for approved equal manufacturers.

#### 2.02 PIPE ALIGNMENT GUIDES

- A. Painted steel cylinder guide assembly with welded mounting brackets, 2-piece pipe clamp "Spider" assembly.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Line Expansion:
  - 1. U-Bends: Install U-bends or loops in all piping subject to expansion and contraction. OPTION: Provide Metraflex Metraloop, sized per Manufacturer's recommendations.
  - 2. Expansion Joints: Where unable to provide U-bends, or where specifically shown or specified, provide expansion joints. Install according to the Manufacturer's instructions.
- B. Branch Connections: Branch connections to mains shall be made with a minimum of (2) 90 deg. elbows, and shall incorporate at least (1) change of direction in the horizontal plane and (1) change of direction in the vertical plane, before connecting to equipment or fixtures or before dropping in or rising in a wall.
- C. Bullhead connections in any piping service are expressly prohibited.
- D. Guides: All loops and expansion joints shall be supplemented with adequate guides as close to loops and joints as possible, and at recommended intervals from joints, to preserve alignment and pitch. Guides shall be rigidly secured to the structure and shall permit axial movement only. Follow Manufacturer's instructions where applicable.
- E. Anchors: Pipe anchors shall be installed where required to secure the pipe and totally eliminate movement. They shall be attached securely to the structure.

END OF SECTION 220510

SECTION 220511 - PLUMBING ROUGH-IN AND FINAL CONNECTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Provide service rough-ins. Refer to approved equipment drawings for exact rough-in sizes and locations. Coordinate rough-in with all items of equipment. Coordinate rough-in locations with the Owner.
- B. Provide piping, valves, and specialties as required and as specified under other Sections of these Specifications.
- C. Provide stops on supply connections to equipment not otherwise furnished with integral stops.
- D. Make final connections to equipment furnished by the Owner, unless otherwise noted.

END OF SECTION 220511





SECTION 22 05 14 - PLUMBING FOUNDATIONS AND SUPPORTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Provide concrete pads and bases and all steel reinforcing bars and mesh.
- B. Contractor shall locate and size concrete supports for its equipment.
- C. Carefully coordinate locations, sizes, and extent of all foundations with the Structural Engineer.
- D. Refer to Division 03, "Concrete," for additional requirements regarding concrete work.
- E. Provide all structural supports between building structural framing members to support major plumbing equipment, including water heaters, air compressors, etc.
- F. Provide support steel, attached to building structure, as necessary, to support piping and smaller plumbing equipment items.
- G. Provide any other support steel required.
- H. For any variation in supports needed for equipment actually purchased, obtain prior written approval of the A/E. Contractor shall bear all costs of modifications, including redesign costs.
- I. Provide supports between structural members, such as steel angles, channels, unistrut, etc.
- J. Provide angles, clips, mechanical fasteners, reinforcement steel, drilling of structure, welding to structure, etc. as needed. Means of attachment shall be approved by the A/E and shall not degrade the structure.

PART 2 PRODUCTS

2.01 SUPPORT STEEL

- A. Provide standard structural shapes, steel beams, unistrut, standard-weight black steel pipe, or steel angle of adequate size and strength to safely carry the weight of equipment item. Verify size required with the Structural Engineer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Attach all items of equipment securely to structure, floor, or concrete pad.

3.02 CONCRETE PADS

- A. See spec section 033000 for concrete pads. Coordinate with G.C. for installation.

END OF SECTION 22 05 14



## SECTION 220515 - PLUMBING SLEEVES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 00, "Common Work Results for Plumbing."
- B. Section 22 07 19, "Plumbing Piping Insulation."

#### 1.03 DESCRIPTION

- A. In Drywall, Masonry, or Concrete Wall Construction:
  - 1. Option for above ceiling only: omit block(s) where required for penetrations, and shall provide square-finished opening. Do not omit blocks under bearing points or in fire-rated or smoke-rated walls. Do not omit blocks in walls which serve as sound barriers.
  - 2. Coordinate with the A/E and Structural Engineer.
  - 3. Provide openings through metal building walls and roofs, and seal watertight.
- B. In precast concrete work, in lieu of sleeves, cut holes after erection of concrete.
- C. Sleeve where pipes pass exposed through walls, and where any piping passes through smoke-rated or fire-rated separations, equipment room walls, or above-grade floors.
- D. Verify which walls, ceilings, or floors are fire-rated, if any, and provide approved fire-blocking or fire-protective devices.
- E. Carefully coordinate and check locations of sleeves immediately before and after each concrete pour and masonry installation.
- F. If sleeves are not installed in construction, due to fault of the Contractor, holes through masonry or concrete construction shall be core drilled at the expense of the Contractor.
- G. Sleeves are not required in floor slabs on grade or in core-drilled openings not requiring waterproofing or firestopping. EXCEPTION: Sleeves are required at core drilling through hollow core pre-cast slabs and through concrete block walls, to facilitate containment of required firestopping material.
- H. Sleeving with absolutely watertight seal is required for piping passing through exterior walls above grade, and underground foundation walls and other below-grade penetrations into building.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. Factory Mutual Global (FMG).
  - 2. Underwriters Laboratories, Inc. (UL).

### PART 2 PRODUCTS

#### 2.01 STANDARD SLEEVES

- A. Pipe sleeve material:
  - 1. Up to 8 in. diameter: Machine-cut Schedule 40 black steel pipe.

2. Bare copper piping: Copper sleeves.
  3. OPTION: In walls: Schedule 40 plastic pipe may be used for pipe sleeves, except where adjacent ceiling space is used for return air plenum. Refer to Drawings.
- B. Sizing: Sleeves shall be large enough for insulation to be continuous, or for watertight or fire-rated sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around pipe or pipe insulation.

## 2.02 WATERTIGHT SLEEVE SEALS

- A. Oakum Caulking: Thiokol Corp. With lead-pour or elastomeric sealant. Elastomeric sealant shall be 2-component, polysulfide or polyurethane.
1. Other Acceptable Manufacturers: Approved equal by 3M, Calpico, or Hilti.
- B. OPTION: Compression Seals: Thunderline Corp. Linkseal. Stainless steel bolts and nuts. Provide correct size seal, and coordinate with sleeve size.
1. Other Acceptable Manufacturers: Approved equal by Wayne, Michigan, or Calpico.
- C. Provide sleeves with waterstop anchor flange at midpoint where penetrating structure at or below grade.
1. Acceptable Manufacturers: Calpico, 3M, or Hilti.

## 2.03 FIRE-RATED SLEEVE SEALS

- A. ASTM E119 and E814 Silicone RTV foam, UL-approved.
1. Acceptable Manufacturers: Dow Corning 3-654B, Chase Foam, 3M Fire Barrier caulking or putty, IPC Flamesafe, Carborundum Fibersil, Nelson Fire Stop, Johns-Manville Cerafiber, KBS Mortar Seal, Hilti Fire Stop, International Protective Coatings Corporation "Flame-Safe," or CSD Sealing Systems "FSP."
- B. Plastic drain, waste, and vent stacks, and lines penetrating fire-rated floors, ceilings, and walls shall be fire-blocked and waterproofed using ProSet Systems, Inc., Series 45 or 55 couplings and Series 90 Code Red Firestop devices. All other plastic drain openings, such as closet stubs, and floor drains, shall be fire-blocked and waterproofed using ProSet Systems C, and E-Z Flex flexible couplings.

## PART 3 EXECUTION

### 3.01 COORDINATION

- A. Coordinate location of sleeves, core drilled holes, and other holes required with the equipment, other Trades, and Structural Engineer.

### 3.02 CUTTING

- A. Cut off sleeves through walls flush with each surface.
- B. Cut off sleeves 1/8 in. above finished floors and 3 in. above floors on Mezzanine. Bottom of sleeve shall be cut off flush with surface.
- C. Refer to Division 00, "Procurement and Contracting Requirements," General Conditions and Special Conditions, and Division 01, Section 01 73 29, for specific requirements regarding approved cutting methods.

### 3.03 INSTALLATION

- A. Piping shall not bear on sleeves. Sleeves shall be installed plumb and true to line, grade, and position.

- B. All pipe sleeves and escutcheons shall have ample clearance for pipe and covering, and shall have chrome-plated wall and floor escutcheons over the pipe in finished areas. Provide chrome-plated or prime-coated escutcheons in other rooms.
- C. Fire Blocking of Penetrations of Fire-Rated Construction:
  - 1. Use approved, UL-listed, fire-retardant sealants, backing, and packing as required to maintain fire rating of the structure penetrated.
  - 2. Spray UL-listed foam sealant around exposed piping entering and leaving fire-rated wall or floor structures.
  - 3. To ensure fire blocking, close space around pipes passing through walls and floors. Seal space up to a 1/2 in. gap with sealant or caulking. Close off space greater than a 1/2 in. gap with sheet metal and seal airtight.
  - 4. For larger openings, provide UL-listed, FMG-approved KBS sealbags as manufactured by International Protective Coatings Corporation.
  - 5. Pack all fire-rated or sound-rated separation sleeves with glass fiber, high-temperature mineral wool, aluminum-silica fiber, fire-retardant rope, calcium silicate, or other noncombustible material to maintain fire rating of structure, and finish with fire-rated sleeve seals.
  - 6. Fill space around all sleeves extending into exposed areas with material compatible with adjacent construction and finish.
  - 7. All openings shall have been tested by Underwriters Laboratories utilizing the proper rated penetrations to be equal to, or greater than, the barrier assembly in which the penetration occurs.
  - 8. All penetrations and openings shall be installed in accordance with the Manufacturers' instructions.
  - 9. The fire-blocking assembly shall maintain the required fire-resistance rating of the wall or floor in which it is placed, and a further sealant shall be applied, if necessary, to attain a smoke-tight condition. Openings without sleeves shall be closed in the same manner.
  - 10. Refer to Section 07 90 00 for additional requirements.
- D. Watertight Seals:
  - 1. Pipe sleeves penetrating outside wall or slabs on grade shall have welded intermediate flange imbedded in masonry. Space around pipe shall be clamped, packed, and caulked with lead and oakum to make an absolutely watertight seal within sleeve. Caulk around outside of sleeve.
  - 2. OPTION: Install compression seals.
- E. Unused sleeves shall be plugged, fire-packed, and finished to match adjacent surface.

END OF SECTION 220515



SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 54, "Plumbing Valve Tagging."

1.03 DESCRIPTION

- A. Provide valves to facilitate maintenance and isolation of piping systems.

1.04 QUALITY ASSURANCE

- A. Standards:
  1. American National Standards Institute (ANSI).
  2. American Society for Testing and Materials (ASTM).
  3. American Society of Mechanical Engineers (ASME).
  4. American Society of Sanitary Engineers (ASSE).
  5. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

1.05 ACCEPTABLE MANUFACTURERS

- A. Unless noted otherwise, use the Manufacturers listed or approved equal by Apollo, Hammond, Kitz, Milwaukee, Nibco, or Watts.
- B. Manufacturer and Model Number listed under Part 2 shall be considered to be the Design Base Manufacturer and Model Number.
- C. All valves of the same type used on the Project shall be by the same Manufacturer.

PART 2 PRODUCTS

2.01 BALANCING VALVES (2 IN. AND SMALLER)

- A. 200 PSIG, ASTM B-62 bronze body/brass ball, threaded or solder joint ends, differential pressure read-out ports, 1/4 in. drain port, memory stop feature to allow valve to be closed for service and reopened to setpoint without disturbing balance position, and calibrated nameplates to ensure specific valve settings.
- B. Acceptable Manufacturers: ITT Bell & Gossett CB Series, Nibco Fig. 1710, or Taco ACUF Series.

2.02 BALL VALVES (3 IN. AND SMALLER)

- A. 150 lb. SWP, bronze body, threaded or solder joint ends, TFE seat and seals, stainless steel ball, blow-out-proof stem, extended handle with vapor seal, adjustable memory stop, and protective sleeve.
  1. ONLY Acceptable Ball Valve Manufacturers: Milwaukee Model BA-100 or BA-150 or approved equal by Watts No. B-6000 or B-6001, Apollo 70-100 or 70-200, Hammond 8501 or 8511, Nibco 580-70 or 585-70, or Kitz 68 or 69.



- B. With Lockable Handles: 150 lb. SWP, bronze body, threaded ends, TFE seat and seals, stainless steel ball, extended handle with vapor seal, adjustable memory stop, and protective sleeve.
  - 1. Acceptable Manufacturers of ball valves with lockable handles: Milwaukee Model BA-100 LD, Apollo No. 70-100-27, or Nibco 580-70-LH.

#### 2.03 CHECK VALVES

- A. 2 in. and Smaller: Milwaukee Fig. 509 or 1509. 125 lb. SWP, ASTM B-62 bronze body, swing check, threaded or solder joint tubing ends, with renewable bronze disc and integral seat.
- B. 2-1/2 in. and Larger (swing): Milwaukee Fig. F-2974. 125 lb. SWP, iron body, bronze trim, with flanged ends.

#### 2.04 DRAIN VALVES

- A. Milwaukee Fig. BA-100H or BA-150H (threaded or soldered ends). 3/4 in. bronze hose-end ball valve, with cap and chain.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install valves and specialties in locations accessible to qualified personnel for operation, removal, maintenance, or servicing, as indicated on the Drawings, as discussed in other Sections of these Specifications, and to facilitate the maintenance, operation, and servicing of all plumbing piping systems. Coordinate with structure, and mechanical and electrical equipment.
- B. Tag all valves as required in Section 22 05 54.
- C. Install valves with handwheel at or above centerline of pipe.
- D. Install valves at service connections to equipment, or branch lines at mains, at low points for draining and at high points for venting.
- E. Install 3/4 in. drain valves at low points in piping to provide complete drainage of all systems.
- F. Install ball valves on hot and cold water branches serving more than (1) fixture, and in supply lines to any equipment not provided with stops.
- G. Install valve at inlet and outlet to water heater.
- H. Extend drain from water pressure relief valve to 6 in. above floor, or to floor drain, .
- I. DO NOT INSTALL any valves where the fluid operating pressure exceeds 80% of its pressure rating.
- J. Open up valves fully before soldering to piping.
- K. During soldering or brazing, remove valve internals and protect the remaining element of sweat end valves against heat damage.
- L. DO NOT INSTALL solder joint valves on systems where the fluid temperature may soften the solder.
- M. DO NOT USE union fittings on soldered copper connections.

#### 3.02 TESTS

- A. Test all valves for tightness.

- B. Test-operate all valves at least once from closed-to-open-to-closed positions while valve is under pressure.

END OF SECTION 220523



## SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 10, "Plumbing Piping Expansion, Noise, and Vibration Isolation."

#### 1.03 DESCRIPTION

- A. Provide hangers, supports, and inserts required for piping and equipment installed under the Plumbing Contract.
- B. Provide all necessary inserts, expansion shields, beam clamps, pipe floor supports, and auxiliary steel.
- C. For Precast Flexicore Concrete: Provide concrete inserts, toggle bolts, etc., for Plumbing Work.
- D. Hangers for all insulated piping shall be sized for outer diameter of insulation.
- E. Provide any additional supports, auxiliary steel, or fasteners required for attaching to structure.
- F. All hangars and supports exposed in the washbay shall be of stainless steel construction.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society of Mechanical Engineers (ASME).
  - 3. American Society for Testing and Materials (ASTM).
  - 4. Factory Mutual Global (FMG).
  - 5. Manufacturer's Standardization Society (MSS).
  - 6. National Fire Protection Association (NFPA).
  - 7. Underwriters Laboratories, Inc. (UL).
- B. All piping supports and parts shall conform to the latest requirements of the Code for Power Piping (ANSI B31.1) and MSS Standard Practice SP-58, SP-69, and SP-89, except as supplemented or modified by the requirements of this Specification.
- C. Components shall be selected and matched to the load imposed on them.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Pipe Hangers, Beam Clamps, Wall Brackets: Anvil International, Inc., B-Line Systems, Inc., Carpenter & Patterson, Inc., Globe Pipe Hanger Products, Inc., Erico/Michigan Hanger Co., Inc., National Pipe Hanger Corp., or PHD Manufacturing, Inc.
- B. Channel Support Systems: B-Line Systems, Inc., GS Metals Corp., Erico/Michigan Hanger Co., Inc., National Pipe Hanger Corp., Unistrut Corp., Wesanco, Inc., or Powerstrut.
- C. Thermal Hanger Shield Inserts: Buckaroos, Inc., Carpenter & Patterson, Inc., PHS Industries, Inc., Pipe Shields, Inc., Rilco Manufacturing Co., Inc., or Value Engineered Products, Inc.

## PART 2 PRODUCTS

### 2.01 HANGERS

- A. Un-insulated Piping:
  - 1. Steel, cast iron, or plastic: 1/2 in. to 8 in.: Anvil Fig. 69. Galvanized carbon steel, adjustable swivel ring.
  - 2. Copper, 1/2 in. to 4 in.: Anvil Fig. CT-99. Copper-plated hangers, adjustable tubing ring, carbon steel ring, and malleable iron adjusting nut.
- B. Insulated Piping:
  - 1. Steel, plastic, or copper; all sizes: Anvil Fig. 260. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
  - 2. Cast iron, all sizes: Anvil Fig. 590. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
  - 3. Thermal protector:
    - a. 2 in. and smaller: 12 in. long segment of rigid pipe insulation supported by Anvil Fig. 167, 18 ga. galvanized steel protection shield.
    - b. 2-1/2 in. and larger: Pipe Shield, Inc., Model CS or CS-CW, waterproof hydrous calcium silicate, or ASTM C552, Type I cellular glass, encased in 360 deg. galvanized steel shield, same thickness as adjoining insulation, or equal by Insul-Shield.
  - 4. Hanger size shall be sufficient to accommodate pipe and insulation without compressing the insulation.
- C. Vertical Piping: Anvil Fig. 261. Friction riser clamp with 2-point bearing. Use Anvil Fig. CT-121 copper-plated riser clamp for copper pipe. Shorten legs to conceal riser clamp within pipe chase and still provide adequate support.
- D. For Piping Indicated to be Installed "Tight to Ceiling or Wall":
  - 1. Un-insulated, 1/2 in. to 4 in.: Anvil Fig. 262. Carbon steel. OPTION: Power-Strut channels with Model PS 3126 hold-down clamp, use with rubber cushion for copper pipe.
  - 2. Insulated, 3/4 in. to 8 in.: Anvil Fig. 103. Carbon steel, offset pipe clamp.

### 2.02 SPRING HANGERS

- A. Peabody Noise Control Model SH. High-deflection spring element and noise isolation pad, assembled into a welded steel bracket.
- B. Anvil Fig. B268, Type A or B. Steel, adjustable pre-compressed variable spring.

### 2.03 TRAPEZE HANGERS

- A. Unistrut P1000 or Superstrut A1200. Angle iron, or channel of sufficient length to support pipes and insulation on individual hangers, roller supports or saddles with insulation protectors, support capacity, support spacing, trapeze hanger rod diameter, and quantity to support total piping load.
- B. Provide individual piping attachment to each Unistrut hanger, angle, or channel.
- C. Design support system and obtain approval of a Structural Engineer licensed in Ohio. Submit details to the A/E for approval.

## 2.04 SUPPORTS

- A. Pipe hanger rods shall be solid steel, threaded ends or all-thread rods of diameter listed below, with double nut attachment to the hanger and at the hanger attachment. Sizes are as follows:

PIPE SIZES	ROD DIAMETER
Up to 2 in.	3/8 in.
2-1/2 in. and 3 in.	1/2 in.
4 in. and 5 in.	5/8 in.

(3/8 in. rods are acceptable for plastic vent lines)

- B. Beam Clamps (up to 8 in. diameter pipe):
1. Anvil Fig. 227. Top beam clamp, steel jaw, hook rod with nut, and spring washer steel eye-bolt, with Anvil Fig. 157 for appropriate rod diameter.
  2. OPTION: Anvil Fig. 86. Malleable iron clamp, hardened steel cup point set screw with Fig. 89 steel retaining clip. C-CLAMPS WITHOUT RETAINING CLIPS ARE EXPRESSLY PROHIBITED.
- C. Purlin Clamps: PHD Fig. 290 Purlin Clamp. Malleable iron with jam nut, and pointed steel set screw. Confirm the type to be used with Building Manufacturer.
- D. Wall Brackets: Carbon steel, back plates, and bolts.
1. Anvil Fig. 194. Lightweight 750 lb. load.
  2. Anvil Fig. 195. Medium-weight 1,500 lb. load.
  3. OPTION: Unistrut Superstrut A1200.

## 2.05 PIPE-INSULATING SUPPORT

- A. Piping 1-1/2 in. and Smaller: Anvil Fig. 167. Provide 12 in. long, 18 ga. sheet metal half round piping shield inside clevis hanger.
- B. Piping 2 in. and Larger: Pre-compressed fiberglass load-bearing segment, integral fire-retardant vapor barrier jacket and saddle.
1. Acceptable Manufacturers: Insul-Coustic Co. Insul-Shield, Pipe Shield, Inc., or Buckaroos, Inc.

## 2.06 CONCRETE INSERTS

- A. Refer to Manufacturer's recommendations for correct selection as to pipe size and loading. Confirm with ththat the concrete used is of a sufficient strength to hold the insert. Use inserts.

## 2.07 FINISH

- A. Unless otherwise noted, all steel hangers and supports shall be standard black. EXCEPTION: Hangers and supports for exposed exterior applications shall be galvanized.

## 2.08 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A36 / ASTM A36M, steel plates, shapes, and bars, black and galvanized.

## 2.09 HANGER COVERS

- A. Buckaroos, Inc., Wraparoos. 2-piece PVC cover, includes 18 in. long PVC hanger rod cover. Snap-on design, adhesive seals, to 205 deg. F. temperature, available in multiple colors.
- B. Other Acceptable Manufacturers: Equal by Pipe Shields, Inc., or PHS Industries.

### PART 3 EXECUTION

#### 3.01 INSTALLATION — GENERAL

- A. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, loops, and bends, where used.
- B. Ceiling and ceiling grid systems shall not be used to support ductwork, electrical conduit, heating, plumbing or fire suppression lines, or any other utility lines. Piping, ductwork, conduit, and each ceiling and ceiling grid system shall be a separate installation, and each shall be independently supported from the building structure. Where interferences occur, in order to support piping, install trapeze-type hangers or supports, which shall be located where they do not interfere with access to valves and other plumbing equipment items.
- C. Where necessary, provide proper angles or channels between structural members for hanger supports. Provide additional auxiliary steel and fasteners to hang from purlins. Weld to steel structural members. Consult with the A/E regarding this procedure.
- D. Do not support hangers from roof deck or floor above. Span from structural members with supplementary steel where direct attachment to structural members is not practical.
- E. Avoid cutting concrete or masonry by using inserts.
- F. Use top flange beam clamps to avoid burning metal deck.
- G. The use of powder-actuated anchors or fasteners is strictly prohibited.
- H. At the Contractor's option, trapeze hangers may be used where parallel runs of pipe occur. All rods on trapeze hangers shall be 1/2 in. minimum. Clamp each pipe individually. Provide individual U-bolt clamps for insulated pipes. Clamp size to accommodate insulation and shield.
- I. Use a separate hanger for each pipe. Do not hang (1) pipe from another.
- J. Vertical waste stacks shall rest firmly on masonry footings and be firmly supported at each floor.
- K. Support vertical risers at the floor with friction riser pipe clamps.
- L. Whenever insulated pipe is supported by hangers, the hanger shall pass freely around the insulation.
- M. Protect the insulation where hangers contact pipe with saddles or protection shields.
- N. Install all hangers and supports with all necessary inserts, bolts, rods, nuts, washers, and other accessories, according to Manufacturer's recommendations. (Hangers shall be double-nutted.)
- O. Pipe hangers shall be adjusted to proper elevation and all hanger rods shall be installed in a plumb position before pipe insulation is installed.
- P. THE USE OF C-CLAMPS WITHOUT RETAINING CLIPS IS STRICTLY PROHIBITED.
- Q. Where hanging from Z-purlins, use purlin clamps. OPTION: Drill vertical portion of purlin and provide angle bolted to purlin and threaded for hanger rod. Obtain approval of the A/E for attachment method before proceeding. CMetal Wall Panel Construction: Do not attach or support piping from metal panels. HANGING DIRECTLY FROM METAL PANEL WALLS IS PROHIBITED. FASTEN TO PURLIN OR GIRT.
- R. Metal Fabrication: Fit connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size and space limitations. When field-welding, comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

- S. Painting:
  - 1. Touch-up: Clean field welds, bolted connections, and abraded areas of all shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same paint materials as used for shop painting. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
  - 2. Galvanized surfaces: Clean and apply galvanizing repair paint to comply with ASTM A780.

3.02 HANGER AND SUPPORT INSTALLATION

- A. Install necessary pipe hangers and supports to properly support piping and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," are not exceeded. Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments to properly support piping from building structure.
- B. Maximum spacing of piping supports shall be as follows:

PIPE SIZE	STEEL PIPE	COPPER PIPE
3/4 in. or smaller	6 ft.	5 ft.
1 in.	6 ft.	6 ft.
1-1/4 in.	6 ft.	6 ft.
1-1/2 in.	6 ft.	8 ft.
2 in.	10 ft.	8 ft.
2-1/2 in.	10 ft.	9 ft.
3 in.	10 ft.	10 ft.
4 in. and larger	10 ft.	10 ft.

- C. Cast Iron Piping: 5 ft. maximum spacing (10 ft. spacing permitted where 10 ft. pipe lengths are installed) behind every hub, at branch connections, and at each change of direction.
- D. Plastic Piping: Locate and space per Manufacturer's recommendations. (4 ft. maximum spacing on plastic soil and vent piping.)
- E. Provide additional supports as necessary to maintain piping alignment.
- F. Install wall brackets where required. Provide pipe guides and anchors as required to properly control pipe movement. Method shall suit job conditions. Refer to Section 22 05 10.
- G. Support piping at pumps and equipment from floor, structure, or walls, so that piping weight is not supported by pumps or by equipment. Install spring hangers on inlet and outlet piping of pumps.
- H. Support piping near elbows, such that the total cantilevered length for both sides of the elbow does not exceed 3 ft.
- I. Install hangers and supports to provide slope where indicated.

END OF SECTION 220529





SECTION 220553.02 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Identify by labels and tags the following items:
  1. Equipment such as electric water heaters, pumps and similar items.
  2. Piping exposed in equipment rooms or accessible service areas.
  3. Piping running above accessible ceiling construction.
  4. All shock absorbers, whether accessible or not.
  5. Trap primers, including description of what floor drains are served.
- B. Install laminated plastic nameplates for equipment, and stencils for piping.
- C. Install piping identification at MAXIMUM 25 FT. intervals.
- D. For piping systems not listed, verify with the Owner.

1.03 QUALITY ASSURANCE

- A. Standards:
  1. American National Standards Institute (ANSI).
  2. American Society of Mechanical Engineers (ASME) A13.1.
  3. Occupational Safety and Health Administration (OSHA).

1.04 ACCEPTABLE MANUFACTURERS

- A. Seton "Setmark" or approved equal by Brady, MSI, or Calpico.

PART 2 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION

- A. Engraved laminated plastic nameplates, sized for 3/4 in. high letters or numbers, Gothic style.

2.02 PIPING IDENTIFICATION

- A. Stencils. Letter size shall be as follows:

OVERALL PIPE/INSULATION SIZE	MINIMUM LETTER HEIGHT
Up to 1-1/4 in. diameter	3/4 in. high
1-1/2 in. to 2 in. diameter	1 in. high
2-1/2 in. to 6 in. diameter	1-1/2 in. high

2.03 IDENTIFICATION SCHEDULE

- A. Identify as follows:

TYPE OF SERVICE	BACKGROUND COLOR	TEXT COLOR	DESIGNATION
Domestic Cold Water	Green	White	DCW
Domestic Hot Water (109 deg. F.)	Yellow	Black	DHW-109

TYPE OF SERVICE	BACKGROUND COLOR	TEXT COLOR	DESIGNATION
Domestic Hot Water (140 deg. F.)	Yellow	Black	DHW-140
Domestic Hot Water Return (109 deg. F.)	Yellow	Black	DHWR-109
Sanitary	Green	White	SAN
Sanitary Vent	Yellow	Black	V
Gas	Yellow	Black	GAS
Compressed Air	Yellow	Black	AIR
Grease	Yellow	Black	GRS
Hydraulic Oil	Yellow	Black	HYDOIL
Motor Oil (15W40)	Yellow	Black	MO(15W40)
Motor Oil (5W20)	Yellow	Black	MO(5W20)

PART 3 EXECUTION

3.01 COORDINATION

- A. Coordinate to ensure that the identification used by all Trades is uniform in type, style, and appearance.
- B. Coordinate the exact nomenclature to be used on equipment nameplates with the Owner and A/E.

3.02 INSTALLATION

- A. Equipment tags and nameplates shall be attached with stainless steel screws. EXCEPTION: Use compatible adhesive where screws might damage equipment.
- B. Apply piping identification only after any finish painting is completed. Provide service and flow arrow designations at MAXIMUM 25 FT. intervals.
- C. Also identify piping at connections to equipment, at valves, at branches from main, at each riser, and at both sides of wall or partition through which pipe passes.
- D. Where pipes pass through a wall or partition, apply a service label on the pipe where it enters and exits the wall.
- E. Apply stencil over background, in colors as indicated above, and varnish over when dry. Stencils shall be readable from a standing position.

END OF SECTION 220553.02

## SECTION 220554 - PLUMBING VALVE TAGGING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Provide valve tags on all plumbing valves. EXCEPTION: Valves or stops serving only (1) plumbing fixture need not be tagged. Tags shall be stamped with service designation and numbered consecutively for each system. Attach to valves or as directed by the A/E.
- B. Prepare valve tag directory with charts showing locations, designations, and sizes of valves. Laminate under plastic and mount as directed by the A/E. Additional copies of valve charts shall be included in the Operating and Maintenance Manuals.

#### 1.03 ACCEPTABLE MANUFACTURERS

- A. Seton, Brady, MSI, or Calpico.

### PART 2 PRODUCTS

#### 2.01 TAGS

- A. 2 in. diameter, 19 ga., brass tag with brass jack chain. 1/4 in. high stamped letters over 1/2 in. high stamped numbers, both black-filled.

#### 2.02 IDENTIFICATION SCHEDULE

- A. Identify as follows:

TYPE OF SERVICE	VALVE TAG DESIGNATION
Water Service	W
Domestic Cold Water	DCW
Domestic Hot Water (109 deg F.)	DHW-109
Domestic Hot Water Return (109 deg F.)	DHWR-109
Gas	GAS
Compressed Air	AIR

### PART 3 EXECUTION

#### 3.01 COORDINATION

- A. Coordinate to ensure that the identification used by all Trades is uniform in type, style, and appearance.

#### 3.02 INSTALLATION

- A. Attach tags to valves in such a manner that valve shall be operable without removing or damaging tag. Tags shall be readable from a standing position when valve is in normal position.
- B. Add valve tag numbers to Record Drawings.

END OF SECTION 220554



## SECTION 220560 - REQUIREMENTS FOR COMPLETION OF PLUMBING WORK

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 00, "Common Work Results for Plumbing."
- B. Section 22 05 06, "Plumbing Submittals."
- C. Section 22 05 07, "Plumbing Operating and Maintenance Manuals."
- D. Section 22 05 53, "Identification for Plumbing Piping and Equipment."
- E. Section 22 05 54, "Plumbing Valve Tagging."

#### 1.03 DESCRIPTION

- A. Complete and submit the following list, which is a partial list of the items required prior to Contract Completion:
  - 1. Submittals. Refer to Section 22 05 06.
  - 2. Operational tests of all equipment and systems as required in this, as well as other, Sections. Refer to Section 22 05 00.
  - 3. Protection and cleaning. Refer to Section 22 05 00.
  - 4. Operating and Maintenance Manuals. Refer to Section 22 05 07.
  - 5. Record Drawings. Refer to Section 22 05 00.
  - 6. Painting. Refer to Section 22 05 00.
  - 7. Guarantee. Refer to Section 22 05 00.
  - 8. Equipment and piping identification. Refer to Section 22 05 53.
  - 9. Valve tagging. Refer to Section 22 05 54.
  - 10. Instruction of the Owner's personnel as required in this, as well as other, Sections.
  - 11. Spare parts as required in this, as well as other, Sections.
  - 12. Equipment warranties.
- B. Provide or perform all of the above items before Contract Completion.

### PART 2 PRODUCTS

#### 2.01 SPARE PARTS

- A. Provide a receipt, signed by the Owner, for all spare parts and insert it in the Operating and Maintenance Manuals. Furnish (1) complete set of the following spare parts for the Owner's use after the guarantee period expires:
  - 1. Gaskets for each piece of equipment that requires gaskets.
  - 2. Special keys, wrenches, and similar items required, or special tools.
  - 3. Pressure and temperature gauges.
  - 4. A glass for each water gauge.
  - 5. Spare pressure gauge.
  - 6. Domestic water pressure gauge.
  - 7. Spare Cartridge for each waterless urinal

8. Any other parts mentioned elsewhere.

### PART 3 EXECUTION

#### 3.01 FINAL OPERATING TESTS AND PROCEDURES

- A. Prior to Contract completion, conduct system operational tests for a period of at least (5) days, not necessarily consecutive, as scheduled by the Owner, to demonstrate fulfillment of the requirements of the Contract. During this time, adjust equipment so that it will perform as the Manufacturer intended, and so that systems will function as designed.
- B. Each system shall be operated in every mode of operation, and the position of valves, switches, and other devices shall be checked for proper closure, operation, and switching.

#### 3.02 INSTRUCTION OF OWNER

- A. Contractor, shall provide a minimum of (4) hours of in-service training for the system's operators. Provide all applicable user manuals and related training documentation.
- B. Provide training schedule and training outline for approval (45) days prior to Contract Completion.
- C. After all system operational tests have been completed, schedule an instruction period with the Owner. Schedule well in advance, so that all of the Owner's personnel may attend if they desire. Coordinate with the Owner and A/E for date and time of training session(s).
- D. Participate in training sessions. Instruct the Owner's personnel in the operation and maintenance of all systems and equipment. Use Operating and Maintenance Manuals to familiarize the Owner's personnel with equipment and procedures. Allow time as necessary for this instruction. Videotape all Owner training, instructions, and equipment start-up demonstrations. Turn over a copy of the videotape to the Owner. Instruction shall include the following:
  1. Location of equipment and explanation of what it does (function).
  2. Reference to operating instruction manuals for record and clarity.
  3. Coordination of written and verbal instructions, so that the operation of each system is fully understood by operating personnel.
  4. Complete review of items contained in Operating and Maintenance Manuals.
  5. Discussion of maintenance procedures that must be followed by the Owner.
  6. Complete demonstration and explanation of each Special System.
- E. Obtain a signed and dated letter from the Owner, stating satisfactory completion of instruction, listing names of personnel instructed, and listing names of persons giving the instruction. Submit a copy to the A/E. Insert copies in each Operating and Maintenance Manual.
- F. Provide a copy of SAO Form No. 34, "Certificate of Equipment Demonstration," signed by the Owner.

#### 3.03 FOLLOW-UP INSPECTIONS

- A. Make an inspection within (90) days after occupancy of the building to make minor adjustments as needed to ensure that all equipment is operating properly. Schedule with the A/E.
- B. A minimum of (1) month before the end of the guarantee period, contact the Owner and A/E to discuss system operation, and to plan for the future care and maintenance of the system.
- C. (1) month before the end of the guarantee period, contact the Owner and perform an inspection to review any items needing correction.

- D. (1) month before the end of the guarantee period, review the excavated areas and add any backfill as directed by A/E and/or owner due to settling, etc. Re-seed or re-sod as directed by A/E and/or owner.
- E. Complete the punch-list and send back a copy to the A/E, with each item initialed, when completed. Refer to Article 10 of the General Conditions.

END OF SECTION 220560





## SECTION 220719 - PLUMBING PIPING INSULATION

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Insulate the following items:
  - 1. Domestic cold water supply, domestic hot water supply and return piping, regardless of length or location.
  - 2. Domestic water supply and waste pipe under all lavatories and sink fixtures accessible to the handicapped.
  - 3. Each above-ground drain that receives cold water wastes to a point where it connects to main drain.
  - 4. Electric water cooler waste traps and piping to wall.
  - 5. Trap primer drain lines.
  - 6. All sanitary vent piping within 10 ft. of an exterior wall or roof penetration.
- B. All exposed insulated piping and fittings, from floor up to 7 ft.-6 in. above floor, and all exposed insulated piping in the Wash Bay, shall have a PVC cover applied over pipe insulation and solvent welded together. Material shall be same as PVC fitting covers.

#### 1.03 FACTORY-INSULATED EQUIPMENT

- A. Water heater shall be factory-insulated to comply with the State Energy Code.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American Society for Testing and Materials (ASTM) E-84.
  - 2. National Fire Protection Association (NFPA) 255.
  - 3. Underwriters Laboratories (UL).
- B. Insulation shall be in accordance with the State Energy Code.
  - 1. Domestic hot water piping insulation shall provide a maximum allowable heat loss of 35 BTUH per sq. ft. of pipe surface area for above-ground piping.
- C. Installation shall be done by Tradesmen specializing in insulation work in strict accordance with Manufacturer's recommendations.

#### 1.05 FIRE AND SMOKE HAZARD RATINGS

- A. Insulation and related components, such as coverings, coatings, tapes, and cloths, shall not exceed 25 Flame Spread, 50 Smoke Developed, and 50 Fuel Contributed on above ground insulation, according to ASTM E-84 test and NFPA 255.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Leave insulation boxed and stored until time for use. Elevate and cover material to avoid moisture contamination and physical abuse.

1.07 ACCEPTABLE MANUFACTURERS

- A. Owens Corning Fiberglas or approved equal by Schuller, Certainteed, Johns Manville, Armstrong, Rubatex, Imcoa, Manson, or Knauf.
- B. Manufacturer and Model Number listed under Part 2 shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

1.08 SUBMITTALS

- A. Product Data: For each type of product indicated..

PART 2 PRODUCTS

2.01 PIPE INSULATION

- A. Indoor Piping: Owens Corning Fiberglas 25 ASJ/SSL/II. 1-piece, heavy-duty, fiberglass insulation with all-purpose vapor barrier jacket of white kraft bonded to aluminum foil and reinforced with fiberglass yarn, longitudinal pressure-sensitive tape for sealing of lap joint, 0 deg. F. to 800 deg. F. temperature rating. Insulation thicknesses:
  - 1. Domestic cold water, electric water cooler waste trap, above-ground waste and vent, and above-ground trap primer piping:
    - a. 1 in. and smaller: 1/2 in. thick, minimum.
    - b. 1-1/4 in. and larger: 1 in. thick, minimum.
    - c. OPTION: 3/4 in. thick fire-rated Armaflex may be used in walls (not in chases).
  - 2. Below-ground trap primer piping: 3/4 in. thick fire-rated Armaflex.
  - 3. Domestic hot water and domestic hot water recirculating piping: 2 in. and smaller: 1 in. thick, minimum.
- B. In-Wall Piping Domestic Hot Water Pipe: Closed cell, foamed plastic, tubular, 1/2 in. minimum wall thickness, fire-rated, 220 deg. F. temperature rating. Pipe and joints shall be sealed with Manufacturer's approved adhesive.
  - 1. Acceptable Manufacturers: Armstrong fire-rated "Armaflex," Rubatex, or Imcoa.
  - 2. OPTION: Indoor pipe insulation, listed in Paragraph A above, may be used in walls.
- C. Pipe Fittings:
  - 1. Insulation: Owens Corning TIW-1. Wrapped 1 lb. density fiberglass blanket with reinforced foil and kraft vapor barrier facing or molded fiberglass segments with pre-molded, 1-piece PVC plastic covers. Wrapped fiberglass blanket shall be installed to same thickness as pipe insulation.
  - 2. Fitting insulation covers: Pre-molded, 1-piece PVC plastic covers, with maximum 25 Flame Spread and 50 Smoke Developed ratings. Shall be listed and certified for installation in ceiling plenum spaces.
    - a. Acceptable Manufacturers: Ceelco, Johns Manville, Knauf, Speedline, or Proco.
- D. Equipment and Hot Water Heater (if required):
  - 1. Rubatex. Flexible sheet, 3/4 in. thick closed cell, foamed plastic, smooth outer skin, 220 deg. F. temperature rating.
  - 2. Owens Corning Series 703. Flexible 3 lb. density fiberglass sheet with all-purpose jacket of white kraft bonded to aluminum foil and reinforced with fiberglass yarn, 450 deg. F. temperature rating.

- E. Lavatories Accessible to Handicapped: This applies to P-trap and hot and cold water supplies for handicapped lavatories and other lavatories in toilet rooms accessible to the handicapped.
  - 1. Offset P-traps and angle stop/supply assemblies shall be insulated with smooth, abrasion-resistant vinyl plastisol exterior cover with 1/8 in. minimum thickness over cushioned foam insert. Attach pipe covering with nylon tie fasteners. Nylon tie fasteners shall remain substantially out of sight.
  - 2. Acceptable Manufacturers: Brocar Trap Wrap Protective Kit 500R, McQuire ProWrap, Truebro Lav Guard, or Plumberex Pro-Series.

#### 2.02 PVC JACKET OVER PIPE INSULATION

- A. PVC jacket, 1-piece, solvent weld joints.

#### 2.03 MASTICS, ADHESIVES, AND FINISHES

- A. Mastics, adhesives, and finishes shall be approved for their intended use by the Insulation Manufacturers.
- B. Acceptable Manufacturers: Benjamin-Foster, Vimasco, ICC, or Aerobol.
- C. Vegetable or wheat paste is prohibited.

#### 2.04 PIPE-INSULATING SUPPORT

- A. Piping 1-1/2 in. and Smaller: Provide 12 in. long, 18 ga. galvanized or stainless steel sheet metal half round piping shield inside clevis hanger.
- B. Piping 2 in. and Larger: Pre-compressed fiberglass load-bearing segment, integral fire-retardant vapor barrier jacket and saddle.
  - 1. Acceptable Manufacturers: Insul-Coustic Co., "Insul-Shield", or Pipe Shield, Inc.

### PART 3 EXECUTION

#### 3.01 COORDINATION

- A. Coordinate installation of insulation with pressure testing of piping.
- B. Coordinate installation of piping insulation on piping required to be heat-taped with the Electrical tradesman.

#### 3.02 PIPING INSULATION

- A. Do not use damaged or water-soaked insulation.
- B. Insulate piping where concealed in walls or chases.
- C. Do not install foam insulation in air handling plenum spaces.
- D. Insulation shall be continuous through sleeves and hangers and through walls where no sleeves are required.
- E. Leave no "raw" ends on insulation. Bevel insulation terminations, seal with insulating cement or mastic, and cover ends same as pipe insulation covering. PVC caps over straight-cut ends that have been vapor-sealed may be used in lieu of beveling.
- F. Exposed insulation shall be finished smooth, sized if required, and left ready for painting.
- G. Where piping is installed above the ceiling, and below ceiling insulation, ensure that ceiling insulation has no insulation voids above piping.
- H. Piping shall be pressure-tested and accepted before piping insulation is installed.

- I. Install insulating saddles of non-compressible insulation with a continuous vapor barrier on pipes 1-1/2 in. and larger during the period that the insulation is being applied. Install 12 in. long, 18 ga. half round shields inside clevis pipe hangers at all hangers (regardless of size), unless insulating-type hangers are furnished by the pipe installer. Verify method to be used.
- J. Insulation shields shall be installed at the time insulation is hung, to avoid insulation damage.
- K. All hangers shall be set perpendicular before any insulation is applied. Insulation shall not be applied to cold water piping until insulation saddles are in place at each pipe hanger.
- L. Application shall be made on clean, dry pipes and tanks, with all joints butted firmly together.
- M. Complete installation of insulation and sealing shall be in strict accordance with Manufacturer's recommendations.
- N. All damaged insulation shall be replaced at the Contractor's expense.
- O. Maintain continuity of all insulation. No voids in insulation or vapor barrier will be permitted.
- P. Insulate piping located in walls with 1/2 in. thick fire-rated foam insulation, or indoor pipe insulation, as specified above. Insulate any pipe hanger or pipe support that has direct contact with any hot or cold piping, or any item that is subject to sweating.
- Q. Install PVC fitting covers on all pipe insulation fittings. Tape all joints with matching plastic tape.

### 3.03 PIPE FITTINGS INSULATION

- A. Unless otherwise noted, insulate valves and flanges for all services. Insulate all couplings. Insulator shall verify during bidding the extent of these connections and prepare its bid accordingly.
- B. Fittings shall be insulated with factory-formed mitered sections of pipe insulation or 1 lb. density fiberglass blanket insulation wrapped under compression to full thickness of the pipe insulation. Mitered sections and blanket insulation shall be secured with double wrapping of tape over the entire fitting. Vapor barrier mastic shall be applied on concealed fittings to maintain vapor barrier. Cover with molded PVC plastic cover.
- C. Do not cover flanges and unions initially. Bevel insulation and apply cement to ends. Then add insulation over these items, so that it can be removed without disturbing adjacent pipe insulation. Cover with molded PVC plastic cover.

### 3.04 PIPE JACKET COVERS

- A. In addition to insulation jacketing and fitting covers specified above, install PVC jacket over all exposed insulation below 7 ft.-6 in. above floor. Jacket shall have overlapping joints and shall be sealed with suitable adhesive. Butt joints shall be sealed with matching 3 in. wide ASJ pressure-sensitive tape.

END OF SECTION 220719

## SECTION 221116 - DOMESTIC WATER PIPING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements." Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 29, "Hangers and Supports for Plumbing Piping Equipment."
- B. Section 22 42 00, "Commercial Plumbing Fixtures."
- C. Section 22 47 00, "Drinking Fountains and Water Coolers."

#### 1.03 DESCRIPTION

- A. Connect to water service line above floor slab where shown on Drawings.
- B. Contractor shall provide site water service line.
- C. Provide a complete system of domestic hot water and cold water piping to fixtures and equipment where shown on Drawings.
- D. Sterilize complete domestic water system.
- E. Install backflow preventer on domestic water supply line where shown.
- F. Provide 3/4 in. valved branches on water service at point of entry into building, just past main backflow preventer and at the beginning of each branch, for injecting chlorine for sterilization.
- G. Test complete system.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society for Testing and Materials (ASTM).
  - 3. American Society of Mechanical Engineers (ASME).
  - 4. American Water Works Association (AWWA).
  - 5. American Welding Society (AWS).
  - 6. Factory Mutual Global (FMG).
  - 7. National Sanitation Foundation (NSF).
  - 8. Plumbing and Drainage Institute (PDI).
  - 9. Underwriters Laboratories, Inc. (UL).
  - 10. Local water purveyor.
- B. All piping materials and installation shall comply with State and Local Building Code requirements.

## PART 2 PRODUCTS

### 2.01 WATER PIPING

- A. Above Ground: Type “L” hard drawn copper tubing with wrought or forged copper solder fittings (ASTM B88).
- B. Piping in Earth and Under Slab:
  - 1. 2-1/2 in. and smaller: Type “K” soft copper (ASTM B88), wrought copper fitting, and brazed joints.
    - a. Acceptable Manufacturers: Clow “Super Bell-Tite” or equal by American Cast Iron Pipe Company or U. S. Pipe & Foundry.
- C. Trap Primer Drain Piping: Type “K” soft copper (ASTM B88), wrought copper fitting, and brazed joints.
- D. Pressure washer water piping: provide hydraulic tubing, SAE j-525, seamless (or electric welded) low carbon steel tubing, 1010-1020 alloy, annealed soft, 5,000 psig minimum operating pressure. Minimum wall thickness shall be 5/8” – 0.083” wall, 3/4” – 0.095” wall, 1” – 0.12 wall, 1-1/2” – 0.12 wall. Fittings shall be compatible with the pipe with similar characteristics.
- E. All water piping in the washbay shall be stainless steel ASTM A312, Type 316/316L.

### 2.02 SOLDER AND BRAZING ALLOYS

- A. Solder: 95-5 tin-antimony, lead free.
  - 1. Acceptable Manufacturers: Engelhard “Silvabrite 100,” J. W. Harris Co. “Bridgit,” or Oatey.
- B. Copper Brazing Alloys: Silver/phosphorous or silver/zinc alloys having a melting point greater than 1,000 deg. F. (ANSI B31.1 and AWS A58).
  - 1. Acceptable Manufacturers: Handy Harman Sil-Fos, Airco Welding Products Aircosil, or ESAB Allstate.
- C. Certify that solder and brazing used for entire piping system is lead-free.

## PART 3 EXECUTION

### 3.01 COORDINATION

- A. Coordinate installation height of faucets, hose bibbs, post hydrants, and wall hydrants with the A/E.
- B. Coordinate piping with trusses, beams, joists, walls, HVAC piping, ductwork, equipment, and electrical equipment.
- C. Coordinate location, size, and depth of site water service entrance with the Water Utility Company.
- D. Coordinate location of rough-in and final connections to equipment with the A/E and Owner.

### 3.02 INSTALLATION

- A. Install all valves in accessible locations. Coordinate installation of access panels.
- B. Open valves fully before soldering.
- C. Avoid installing water lines in outside walls. Where unavoidable, install piping so that the wall insulation is between the pipe and the outside wall. Obtain specific approval of A/E.
- D. Install shut-off valves on hot and cold water on each branch serving more than (1) fixture and where shown.
- E. Install ball valves in lines to equipment and fixtures not provided with stops.

- F. Unless otherwise noted, install shock absorbers at the end of each main or branch.
- G. Install backflow preventers where indicated or required by Code.
- H. Provide rigid support for backflow preventer, and drain piping .
- I. Where piping is installed above ceilings and below ceiling insulation, ensure that ceiling insulation has no insulation voids above piping.
- J. Install piping in such a manner as to allow complete drainage of the water piping system, toward the source.
- K. Provide 3/4 in. valved inlet immediately downstream of backflow preventer for purpose of adding sterilizing solution into domestic water piping system.

### 3.03 TESTS

- A. Perform tests as required by the State Building Code and as specified below:
  - 1. Take precautions to remove all air before performing hydrostatic tests.
  - 2. Test piping at 125 PSIG for (6) hours with no pressure drop. All tests shall be made before piping is insulated or concealed. Tests shall be witnessed by the A/E's Representative.
  - 3. If a leak occurs, defective piece or joint shall be replaced. No caulking will be permitted. Tests shall then be repeated.

### 3.04 STERILIZATION OF DOMESTIC WATER LINES

- A. After water piping is complete and fixtures have been installed, flush piping clean and sterilize all domestic hot water, hot water return, and cold water piping, including water heater. The sterilization shall be done under the immediate on-the-job supervision of a Water Testing Laboratory regularly engaged in the service. Pay all fees for testing and use of testing equipment.
- B. With all outlets closed, fill system to working pressure and close valve on supply main.
- C. Open all fixtures slightly and pump a sterilization solution into test tap as follows: 400 minimum to 1000 maximum parts per million chlorine solution made from a sanitation grade of hyperchlorite, 70% available chlorine.
  - 1. Acceptable Hyperchlorites Manufacturers: H.T.H., Perclorn, or Pittchlor.
- D. Each outlet, hot and cold, shall be tested during fill to prove the presence of chlorine at that outlet. Chlorine shall be present at all outlets.
- E. Water piping system shall remain filled for a period of (24) hours and each outlet shall be again tested and shall have at least 100 parts per million of chlorine remaining.
- F. Upon completion of sterilizing, all outlets shall be opened wide and the main supply valves opened, flushing system free of chlorine. Outlets shall be again checked and flushed until free of chlorine. Flush main valves and entire building domestic water system. Coordinate with the A/E and Owner.
- G. After final flushing, all electric water cooler inlet strainers and all aerators shall be removed, cleaned, and replaced.
- H. Chlorination of the system may be performed at same time the pressure test is conducted.
- I. Provide the A/E with a "Certificate of Completion of Chlorination" after chlorination is completed.

END OF SECTION 221116





## SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Provide plumbing piping specialties or accessories as shown or required to complete the installation of all plumbing systems installed on this Project.

#### 1.03 QUALITY ASSURANCE

- A. Standards:
  - 1. American Society of Sanitary Engineering (ASSE).
  - 2. American Society of Mechanical Engineers (ASME).
  - 3. American National Standards Institute (ANSI).
  - 4. Plumbing and Drainage Institute (PDI).
  - 5. U.S. Public Health Service.
  - 6. Underwriters Laboratories, Inc. (UL).
  - 7. Factory Mutual Global (FMG).
  - 8. Food and Drug Administration (FDA).

### PART 2 PRODUCTS

#### 2.01 THERMOMETERS

- A. Trerice "Industrial Type." Blue reading, organic liquid, 9 in. scale, cast aluminum, epoxy powder-coated case, front double-strength window, straight or adjustable angle pattern, brass separable well, range of 30 deg. F. to 180 deg. F. Provide insulation extension.
- B. Other Acceptable Manufacturers: Approved equal by Weiss, Ashcroft, Marsh, Weksler, Winters, or Marshalltown.

#### 2.02 BACKFLOW PREVENTERS

- A. BFP-1, 2-1/2 in. and above: Zurn-Wilkins Model 375OSYFSC. Suitable for continuous pressure, inlet and outlet OS&Y gate valves, inlet strainer, test cocks, differential pressure relief valve with ASME A112.1.2 air gap fitting between (2) independently operated check valves. Entire assembly coated inside and outside with FDA-approved epoxy material.
- B. BFP-2, Power Washer: Watts Series LF909-QT-S. Reduced pressure dual checks, inlet and outlet bronze ball valves, with strainer, air gap drain funnel, line size.
- C. BFP-3, Brine Maker Water Service: Watts Series LF909-QT-S. Reduced pressure dual checks, inlet and outlet bronze ball valves, with strainer, air gap drain funnel, line size.
- D. BFP-4, Chassis Wash Water Service: Watts Series LF909-QT-S. Reduced pressure dual checks, inlet and outlet bronze ball valves, with strainer, air gap drain funnel, line size.
- E. Other Acceptable Manufacturers: Approved equal by Ames Co., CMB Industries, Febco Backflow Preventers, Hersey Products, Conbraco Industries, or Watts Regulator Co.

- F. Other Acceptable Manufacturers: Approved equal by Ames Co., CMB Industries, Febco Backflow Preventers, Conbraco Industries, or Watts.
- G. Refer to Fixture and Equipment Branch Size Schedule on Drawings for sizes and applications.
- H. Backflow Preventer Manufacturer and Model shall be on the list of accepted equipment published by the U. S. Public Health Service.
- I. Note: Before ordering, obtain approval from the Local Water Utility for the specific type and model of backflow preventer to be used.
- J. Backflow preventers shall be serviceable without requiring removal from piping.
- K. Backflow preventers shall have a permanently attached plate indicating type and listing approvals.
- L. Provide ball valve ahead of strainer on inlet side of backflow preventer assembly.

### 2.03 SHOCK ABSORBERS

- A. Wade "Shokstops." (ASSE Standard 1010, PDI-WH201) shock absorbers (water hammer arresters). Sizes as shown on the Drawings.
  - 1. SA-A: 3/4 in. pipe. ([1] to [11] fixture units.)
  - 2. SA-B: 1 in. pipe. ([12] to [32] fixture units.)
  - 3. SA-C: 1 in. pipe. ([33] to [60] fixture units.)
- B. Other Acceptable Manufacturers: Approved equal by Zurn, J. R. Smith, Josam, Watts, Sioux Chief, or Precision Products.
- C. As an option, air chambers may be used. Size of air chambers shall be (1) size larger than supply line and a minimum of 2 ft. in length.
- D. Provide shock absorbers at all locations to reduce water hammer.

### 2.04 STRAINERS

- A. Watts Model 777S. 1/2 in. to 3 in., Y-pattern, bronze body, threaded, #20 mesh stainless steel screen, 200 PSI WOG.
- B. Other Acceptable Manufacturers: Approved equal by Spirax/Sarco, Armstrong, or Hoffman.

### 2.05 EXTERIOR WALL HYDRANTS

- A. WH-1: J. R. Smith "Quarterhorse" Model 5509QT, with bronze faucet face, locking box and cover, freeze-resistant faucet, bronze casing, self-draining, integral vacuum breaker, 3/4 in. size hose connection, length as required for wall. Provide loose key with each hydrant. (ASSE Standard 1019.)
- B. Other Acceptable Manufacturers: Approved equal by Josam, Wade, Woodford, or Zurn.

### 2.06 INTERIOR HOSE BIBBS

- A. HB-1: Watts Model SC-8. Hose bibbs shall have exposed domestic cold water supply, bronze body 3/4 in. NPT male threaded inlet, hex shoulder, tee handle, 3/4 in. male hose threaded outlet.
  - 1. Hose connection vacuum breakers: (ASSE Standard 1011) Watts Model 8A. 3/4 in. hose threaded female inlet x 3/4 in. hose threaded male outlet connection.
  - 2. Other Acceptable Hose Bibb Manufacturers: Approved equal by Chicago Faucet, T & S Brass, or Woodford.
- B. Hose bibbs shall have integral nonremovable vacuum breakers and shall be furnished as follows:
  - 1. Supply:
    - a. Concealed: Nibco #763CL with vacuum breaker on outlet, brass finish.

- b. Exposed: Nibco #74 with vacuum breaker on outlet, brass finish.
- c. Other Acceptable Manufacturers: Approved equal by Chicago Faucet, T & S Brass, Watts, or Woodford.

## 2.07 TRAP PRIMERS

- A. TP-1: Precision Plumbing Products "Prime-Rite," Model No. PO-500 (ASSE Standard 1018). Brass housing nonadjustable flow control valve. Provide distribution unit listed below. Units shall adjust automatically to line pressure and flow.
  - 1. Model No. DU-2 for (2) floor drains.
  - 2. Model No. DU-3 for (3) floor drains.
  - 3. Model No. DU-4 for (4) floor drains.
- B. Other Acceptable Manufacturers: Approved equal by Mifab, Wade, Watts, or Zurn.

## 2.08 PRESSURE GAUGES

- A. Weiss 4PGA-1. Standard single Bourdon tube, black die cast aluminum case, 4-1/2 in. diameter dial, chrome removable slip ring, gauge cock and pigtail,  $\pm 1\%$  accuracy. Range shall be approximately 50% in excess of maximum pressure anticipated. Provide gauge cock.
- B. Other Acceptable Manufacturers: Approved equal by Terice, Marsh, Weksler, Marshalltown, or Ashcroft.
- C. Provide spare gauge.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Locate shock absorbers according to PDI Standard WH-201 and where shown on Drawings. Size indicated on Drawings.
- B. Provide pressure gauges on the water service entrance riser and where indicated on plan.
- C. Provide thermometer on the piping at water heater, on inlet and outlet of mixing valves, and on hot water recirculating pump suction line, where shown on Drawings.
- D. Install wall hydrants flush and level with building wall and generally 24 in. above finished grade. Confirm exact height with the A/E.
- E. All products of the same type shall be by the same Manufacturer.
- F. Provide continuous back pressure type vacuum breakers on all lines to hose bibbs if not furnished with integral vacuum breaker.
- G. Provide shut-off valve ahead of each strainer and backflow preventer.
- H. Provide drain valve on each strainer drain. Extend to nearest floor drain.
- I. Provide ball valve on inlet and outlet connection of inlet connection to each wall hydrant and hose bibb.
- J. Locate equipment backflow preventers below ceilings in area where spillage of water will not cause damage.
- K. Install backflow preventer at an accessible height.
- L. After installation of backflow preventer, flush water supply line to remove debris. Clean out backflow preventer after flushing.

- M. Test backflow preventer at time of installation. A person or firm certified by the Ohio Department of Health shall perform the test and provide the testing equipment. Submit test report to the A/E.
- N. Discharge from each reduced pressure backflow preventer shall have an open air gap. Indirect waste full size to nearest floor drain using steel or copper piping.
- O. Install ball valves and check valves on mixing valve inlets, if not integral.
- P. Install each thermometer and pressure gauge so they may be read from floor.
- Q. Mount trap primer exposed on wall in accessible location, or above ceiling. Install according to Manufacturer's instructions. Provide ball valve ahead of trap primer. Provide access panels where necessary. Provide individual 3/4 in. gravity drains from trap primer to inlet of each floor drain trap where indicated on Drawings.

END OF SECTION 221119

## SECTION 221124 - FACILITY NATURAL GAS PIPING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 23, "General-Duty Valves for Plumbing Piping."
- B. Section 22 34 36, "Commercial Gas Domestic Water Heaters."
- C. Section 23 05 29, "Hangers and Supports for HVAC Piping Equipment."
- D. Section 33 51 00, "Natural Gas Distribution."

#### 1.03 DESCRIPTION

- A. Provide a complete system of interior low-pressure natural gas piping and valves for equipment, and provide final connection. Distribution system pressure shall be 14 in. water column.
- B. Connect to outlet of gas meter regulator outside building wall where shown on Drawings, run next to building wall, and enter building at approximately 18 in. above finish floor through waterproof pipe sleeve.
- C. Connect to site gas service line 5 ft. outside building foundation wall where shown on Drawings. Provide site gas service line.
- D. Extend and connect piping to gas-fired equipment where shown on Drawings.
- E. Extend and connect to building gas piping system where shown on Drawings.
- F. Provide approved flexible connectors for radiant heaters, back-up generator, and each furnace.
- G. Provide equipment gas regulators, if needed, past the shut-off valve.
- H. Test complete system.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society for Testing and Materials (ASTM).
  - 3. International Fuel Gas Code.
  - 4. National Fire Protection Association (NFPA 54).
  - 5. Local Gas Company Standards.
  - 6. All piping materials shall comply with State and Local Building Code requirements.

### PART 2 PRODUCTS

#### 2.01 GAS PIPING

- A. Above Ground and in Building: Standard weight, Schedule 40, welded, plain end, wrought steel pipe and fittings (ANSI B36.10), welded joints with backing rings. Threaded 125 PSI malleable iron fittings are permitted on piping 4 in. and smaller, if less than 5 PSI pressure, except in return air ceiling plenums, and where dropping in walls.

- B. Piping in washbay (optional for other locations): Corrugated stainless steel tubing, flexible (ASTM A240), 125 PSI. Maximum operating pressure shall be 5 PSI. Use only fittings associated with corrugated stainless steel tubing.
  - 1. Acceptable Manufacturers: Titeflex "Gastite" or Omegaflex "Tracpipe."

2.02 LUBRICATED PLUG VALVES (SEE OPTION FOR BALL VALVE)

- A. 1 in. to 2 in.: 150 lb. SWP (200 lb. WOG), semi-steel body, threaded ends with TFE stem seal and seat, square stem, and permanently attached lever handle.
  - 1. Acceptable Manufacturers: Homestead Fig. 611, Powell Fig. 2200, Rockwell 142, or Nordstrom 142.
- B. 2-1/2 in. and Larger: 150 lb. SWP (200 lb. WOG), semi-steel body, flanged ends with TFE stem seal and seat, square stem, wrench-operated. Furnish wrench.
  - 1. Acceptable Manufacturers: Homestead Fig. 612, Powell Fig. 2201, Rockwell 143, or Nordstrom 143.
- C. Each type of valve shall be by same Manufacturer.

2.03 BALL VALVES

- A. Refer to Section 22 05 23 for acceptable Manufacturers and Model numbers.

2.04 BUTTERFLY VALVES (PERMITTED IN LIEU OF PLUG VALVES 2 IN. AND SMALLER)

- A. Milwaukee "Butterball," Model BB2-100. 175 lb. SWP, bronze body, viton seat, threaded ends, stainless steel disc and stem, and lever handle.
- B. Other Acceptable Manufacturers: Approved equal by Watts, Apollo, or Nibco.
- C. Each type of valve shall be by same Manufacturer.

2.05 PRESSURE REGULATORS (IF NEEDED)

- A. (ANSI Z21.18) Sensus. Relief valve and zero governor. Size and capacity as required by equipment.
- B. Other Acceptable Manufacturers: American, Emro, or Sprague.

PART 3 EXECUTION

3.01 COORDINATION

- A. Determine exact gas pressure at inlet of meter regulator. Gas pressure shall be 14 in. water column at outlet of building meter regulator. Confirm exact gas pressure requirements.
- B. Coordinate location of gas line through exterior wall.
- C. Coordinate fixture and equipment location and connection requirements.
- D. Coordinate all piping runs with other work.
- E. Coordinate gas pressure requirements of all gas-fired fixtures and equipment. Provide regulator past the shut-off valve, where required to achieve proper operating pressure for the equipment served.
- F. Coordinate shutdown for gas line connection with the Owner.
- G. Give notice to the State Plumbing Inspector that the work is completed and ready for testing. This notice must be given at least (24) hours in advance of the time when inspection and testing is desired.

### 3.02 INSTALLATION

- A. Gas piping shall run horizontal and pitch upward in the direction of flow.
- B. Gas piping system within building shall be electrically continuous and bonded to the building grounding electrode.
- C. Provide drip legs at any point in line where condensation may collect. A drip shall not be located where the condensation may freeze.
- D. Provide shut-off valve, dirt leg, and union at each final connection to equipment.
- E. Install vents from pressure regulators on gas-fired equipment and on gas trains on heating equipment where required. Extend vent line through outside wall, sleeve and caulk between pipe and sleeve, turn pipe down, and terminate with approved vent cap. Coordinate with all trades.
- F. Provide gas pressure regulators on gas-fired equipment as required for proper operation of the equipment. Install past the shut-off valve. Coordinate with Equipment Supplier and field conditions.
- G. Enter building above finished grade, through building exterior wall in sleeve.
- H. Paint all exposed gas piping.

### 3.03 VENTING

- A. Sleeve and vent to the exterior the following: All gas pressure regulators on gas-fired equipment, if required. Use iron or steel pipe for vents.

### 3.04 TESTS

- A. Perform tests and inspection before concealing any work.
- B. Use air or inert gas, such as nitrogen, to pressurize the building gas piping. In no case shall natural gas, oxygen, acetylene, or other gases be used.
- C. Building gas piping system shall be given a pressure test of not less than 1-1/2 times the proposed maximum working pressure, and not less than 3 PSIG. Test duration shall not be less than (1/2) hour for each 500 cu. ft. of pipe volume or fraction thereof. For piping systems having a volume more than 24,000 cu. ft., the duration of the test need not exceed (24) hours with no leakage.
- D. Obtain approval of Gas Utility Company and State Plumbing Inspector.
- E. Soap-suds-test all exposed fittings at operating pressure.
- F. Should leaks occur, remove the defective section(s) of pipe and fitting(s) and replaced them with new materials without any cost to the Owner.
- G. Repeat test(s) until no defects occur.
- H. The date(s) and result(s) of tests shall be recorded, witnessed, and submitted to the A/E.
- I. Purge system completely after testing. Connect to openings and conduct inert gas (or air) to outside.

END OF SECTION 221124





## SECTION 221316 - SANITARY WASTE AND VENT PIPING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 09, "General Plumbing Piping Requirements."
- B. Section 22 13 23, "Sanitary Waste Interceptors."
- C. Section 22 42 00, "Commercial Plumbing Fixtures."
- D. Section 22 47 00, "Drinking Fountains and Water Coolers."
- E. Refer to Drawings for Fixture and Equipment Branch Size Connection Schedule.

#### 1.03 DESCRIPTION

- A. Provide a complete system of interior soil, waste, and vent piping to fixtures and equipment, including traps, floor drains, and cleanouts. Building drain shall extend to a point 5 ft. beyond the foundation wall, unless otherwise indicated on Drawings.
- B. Connect to site sanitary sewer system 5 ft. outside building foundation wall where shown on Drawings. Extend sanitary line into building.
- C. "Dead end" sanitary branches longer than 2 ft.-0 in. will not be permitted.
- D. Provide oil interceptor.
- E. Test complete system.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American Society of Sanitary Engineers (ASSE).
  - 2. American Society for Testing and Materials (ASTM).
  - 3. American National Standards Institute (ANSI).
  - 4. Factory Mutual Global (FMG).
  - 5. Cast Iron Soil Pipe Institute (CISPI).
  - 6. National Sanitation Foundation (NSF).
  - 7. All pipe and fittings shall conform to the requirements of Commercial Standard CS188.
- B. All piping materials and installation shall comply with State and Local Building Code requirements.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Piping and Fittings:
  - 1. Cast iron: Charlotte, Clow, American Cast Iron, Tyler Pipe, U. S. Pipe & Foundry or Griffin.
  - 2. Copper: American Brass Co., Revere, Chase Brass Co. or Nibco.
  - 3. ABS or PVC plastic: Yardley, Nibco, Crestline or Charlotte.
  - 4. Steel: Armco, Republic or Wheeling.
- B. Floor Drains and Cleanouts: Zurn, Jay R. Smith, Wade, Josam or Watts.

- C. Manufacturer and Model Number listed under Part 2 shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

## PART 2 PRODUCTS

### 2.01 PIPING

- A. Sanitary, waste, and vent piping and fittings under slab:
  - 1. Extra-heavy weight, single hub cast iron (ASTM A74), factory-coated with coal tar enamel.
  - 2. Hubless cast iron (ASTM A74), factory-coated with coal tar enamel.
  - 3. Schedule 40 PVC/DWV plastic (ASTM D2665).
  - 4. Schedule 40 ABS/DWV plastic (ASTM D2661).
- B. Interior above-grade sanitary waste piping and fittings:
  - 1. Service weight, single hub cast iron (ASTM A74), factory-coated with coal tar enamel.
  - 2. Hubless cast iron (ASTM A74), factory-coated with coal tar enamel.
  - 3. Copper DWV tube, 4 in. and smaller (ASTM B306): Type L drainage tube, drawn temper.
  - 4. PVC Schedule 40 solid wall pipe according to ASTM D 1784, D 1785, and D 2665. PVC DWV fittings conforming to ASTM D 1784 and D 2665.
- C. Interior above-grade vent piping and fittings:
  - 1. Service weight, single hub cast iron (ASTM A74), factory-coated with coal tar enamel.
  - 2. Hubless cast iron (ASTM A74), factory-coated with coal tar enamel.
  - 3. Steel pipe, 2-1/2 in. and smaller (ASTM A53): Type E or S, Grade A or B, Schedule 40, galvanized.
  - 4. Copper DWV tube, 4 in. and smaller (ASTM B306): Type L drainage tube, drawn temper.
  - 5. PVC Schedule 40 solid wall pipe according to ASTM D 1784, D 1785, and D 2665. PVC DWV fittings conforming to ASTM D 1784 and D 2665.
- D. Plastic piping is not permitted where it may be vulnerable to physical damage, or where run exposed.
- E. Plastic piping shall not be installed in ceiling spaces used for return air plenums. Refer to Architectural and HVAC Drawings for the location of these areas.
- F. Any exposed vent piping shall be galvanized steel.

### 2.02 JOINTS

- A. Cast Iron:
  - 1. Tarred jute or oakum with lead poured flush with hub.
  - 2. (ASTM C-564) Compression-type plastic seal.
  - 3. Joints in hubless cast iron pipe sizes 1-1/2 in. to 10 in. shall be made with coupling approved to FMG 1680 Class 1 and marked with the logo. Couplings shall be Clamp-All Corporation Model #80, for pipe sizes 1-1/2 in. to 4 in., Model #125 pipe sizes 5 in. to 10 in.
  - 4. Joints in hubless cast iron pipe sizes 1-1/2 in. to 2 in. where exposure to head pressure cannot exceed 10 ft. shall be approved to CISPI Standard 310-85. Couplings shall be manufactured by Anaco, Tyler, Charlotte, or Jones.
- B. Copper: Cast (ASTM B16.23) or wrought (ASTM B16.29) copper drainage fittings with solder joints.
- C. Plastic: Solvents and cements as recommended by the Manufacturer.
- D. All fittings shall be compatible with piping for size, material, and joint type.

- E. Cast iron pipe and fittings shall be factory-coated with coal tar enamel.

## 2.03 FLOOR DRAINS

- A. Drains shall be adjustable, coated cast iron double drainage pattern, bottom outlet, flashing clamp, strainers, sediment buckets, and with other accessories and features as noted below.
- B. Each floor drain grate that has a load rating shall have an ANSI load rating indicated on shop drawings. If rating is not indicated on shop drawings, they will be rejected.
- C. Each floor drain that is required to have a secured grate shall have at least (3) screws for attachment of grate.
- D. Slot in grates shall be free of flashing (clean cut), and tops shall not have sharp edges that may be injurious to bare feet.
- E. FD-1: Zurn #Z415-P-VP. Cast iron body, adjustable, 5 in. diameter Type B strainer, secured, nikaloy finish, nickel/bronze strainer, caulk or push-on outlet, 3 in. or 4 in. pipe size, as noted, and 3/4 in. trap primer connection. Provide vandal-resistant screws on strainer. See section 1.05 for other acceptable manufacturers.
- F. FD-2: Zurn #Z415-P-VP-4. Cast iron body, adjustable, 5 in. diameter Type B strainer, secured, nikaloy finish, nickel/bronze strainer with 4-in. dia. funnel, caulk or push-on outlet, 3 in. or 4 in. pipe size, as noted, and 3/4 in. trap primer connection where indicated. Provide vandal-resistant screws on strainer. See section 1.05 for other acceptable manufacturers.

## 2.04 CLEANOUTS

- A. All cleanouts shall be line size (6 in. size on 6 in. or larger line) and installed in accessible locations.
- B. Provide membrane clamps on all cleanouts in floors having waterproofing membrane.
- C. Floor Cleanouts: Each floor cleanout shall have an ANSI load rating indicated on shop drawings. If rating is not indicated on shop drawings, they will be rejected. Each floor cleanout that is required to have a vandal-resistant top shall have at least (3) screws for attachment to top.
  - 1. Floors with ceramic tile finish: Zurn #ZN1400-VP. Adjustable cast iron body, heavy-duty load rating, vandal-resistant, round, nickel/bronze scoriated cover, ABS plastic plug, line size, and caulk or push-on outlet. See section 1.05 for other acceptable manufacturers.
  - 2. Floors with vinyl tile finish: Zurn #ZN1400-VP. Adjustable cast iron body, heavy-duty load rating, vandal-resistant, round, nickel/bronze cover, ABS plastic plug, line size, and caulk or push-on outlet. See section 1.05 for other acceptable manufacturers.
  - 3. Bare concrete floors: Zurn #Z1400-HD-VP. Adjustable cast iron body, heavy-duty load rating, vandal-resistant cast iron scoriated cover, threaded ABS plastic plug, line size, and caulk or push-on outlet. See section 1.05 for other acceptable manufacturers.
  - 4. Vehicular traffic: Zurn #Z1400-HD-VP. Adjustable cast iron body, heavy-duty load rating, vandal-resistant cast iron scoriated cover, threaded ABS plastic plug, line size, and caulk or push-on outlet. See section 1.05 for other acceptable manufacturers.
- D. Wall Cleanouts: Zurn #ZS1469-VP. Round polished stainless steel access cover, and vandal-resistant screw. See section 1.05 for other acceptable manufacturers.
- E. Exterior Cleanouts: Zurn #Z1400-HD-VP. Adjustable cast iron body, heavy-duty load rating, vandal-resistant cast iron scoriated cover, threaded ABS plastic plug, line size, and caulk or push-on outlet. See section 1.05 for other acceptable manufacturers.

## 2.05 VENT FLASHING

- A. Provide roof vent boots and flashing.

### PART 3 EXECUTION

#### 3.01 COORDINATION

- A. Coordinate piping with beams, joists, foundation, piers, walls, HVAC piping, ductwork, equipment, and electrical equipment, cable trays, lighting, wiring, and conduit.
- B. Coordinate location, elevation, and installation of floor drains, and cleanouts with the equipment, concrete pads, A/E.
- C. Coordinate location of vents through roof with the A/E.
- D. Coordinate location and depth of building sanitary drain installation with the building foundation.

#### 3.02 BUILDING INSPECTION

- A. Examine the areas and the conditions under which interior sanitary piping system work is to be installed and notify the A/E and Owner of conditions detrimental to the proper and timely completion of the Work.
- B. Do not proceed with the Work until unsatisfactory conditions have been corrected.

#### 3.03 INSTALLATION — GENERAL

- A. Pitch soil and waste piping in direction of flow at not less than 1/8 in./ft. and not more than 1/4 in./ft. Pitch pipes 2 in. and smaller at 1/4 in./ft. Pitch all vents for proper drainage. All piping shall be concealed, unless indicated on Drawings.
- B. Minimum size is 2 in. for underground soil and waste piping.
- C. Install P-trap below floor for floor drains and mop service basin.
- D. Install wall cleanouts at the base of all stacks at 18 in. above finished floor where indicated on Drawings. Provide exposed cleanout without cover plate in unfinished areas or in above-ceiling installations.
- E. Plastic piping is prohibited and shall not be installed in ceiling spaces used for return air plenums.
- F. All connections and changes in direction of the sanitary drainage system shall be made with approved drainage fittings.
- G. The fittings shall not have ledges or shoulders that are capable of obstructing flow in the piping.
- H. Fittings shall be installed to guide waste in the direction of flow.
- I. For lavatory waste drainage fittings, provide sanitary tee branch or combination wye and 1/8 bend for single fixture.
- J. All transitions in piping material between below-grade sanitary waste and above-grade sanitary vent shall be made beneath the finish floor slab.
- K. *Install all floor cleanouts flush with finished floor.*

#### 3.04 INSTALLATION — VENTS

- A. Install vents through roof as follows:
  - 1. 3 in. minimum size.
  - 2. Locate at least 8 ft. away from outside wall of building and 20 ft. away from outside air intakes or operable windows.
  - 3. Offset vent piping below roof to allow for thermal expansion and contraction of roof. Minimum of 4 ft. offset.

4. Vents shall extend a minimum of 12 in. above roof, except where specifically required to be higher by Code.
5. Provide roof boots and waterproof membranes and flash into roof construction and make watertight.

### 3.05 INSTALLATION — FLOOR DRAINS AND CLEANOUTS

- A. Install top of floor drains and cleanouts flush and level with wall and finished floor. If not shown on Architectural Drawings, confirm elevation and proper pitch to drains with the A/E before roughing in. REMOVE AND REPLACE ALL ITEMS NOT INSTALLED AT PROPER ALIGNMENT, PROPER ELEVATION, FLUSH AND LEVEL AT NO ADDITIONAL COST TO THE OWNER.
- B. Use graphite on all cleanout plug threads.
- C. Install duct tape over grates for floor drains and over floor cleanout covers to provide protection from scratching and collection of dirt and debris during construction. Remove tape just prior to final inspection.
- D. Install cleanouts in accessible locations.
- E. Where tile is to be installed, adjust top of floor drain or cleanout to be flush with the finished surface.
- F. Exterior cleanouts shall be installed in center of 18 in. square concrete slab, 6 in. thick. Install cleanout and slab flush with finished grade or pavement. Provide concrete slab. Edges shall be mitered.

### 3.06 TESTS

- A. Test entire sanitary piping system as required by the State and Local Building Code and as specified below.
- B. For a minimum test, plug piping at the lowest point and fill with water to highest point on roof to provide a minimum of 10 ft. hd. of water on all parts of the system. Maintain for (1) hour with no leakage. Repair any deficiencies. Conduct final test with smoke or peppermint at 1 in. W.G. for (15) minutes. Install gaskets or reset fixtures.
- C. Perform all tests before any piping is covered or concealed.
- D. Should leaks occur, remove the defective section of pipe and defective fitting and replace them with new materials at no cost to the Owner.
- E. Repeat tests until no leaks occur.

END OF SECTION 221316



## SECTION 221323 - SANITARY WASTE INTERCEPTORS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Division 03, "Concrete."
- B. Section 22 05 05, "Plumbing Excavation and Backfill."
- C. Section 22 13 16, "Sanitary Waste and Vent Piping."

#### 1.03 DESCRIPTION

- A. Plumbing Contractor is responsible for the Work described in this Section. In this Section, the term "Contractor" shall mean the Plumbing Contractor performing Work on this Project, unless otherwise noted.
- B. Provide a sanitary sewer system from building to oil interceptor where shown on Drawings, complete with piping and exterior cleanouts.
- C. Test complete system.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American Society for Testing and Materials (ASTM).
  - 2. American Water Works Association
  - 3. Cast Iron Soil Pipe Institute (CISPI).
  - 4. National Clay Pipe Institute (NCPI).
  - 5. Ohio Department of Transportation (ODOT).
  - 6. State Environmental Protection Agency (EPA).
- B. Installation shall meet State and Local Building Code requirements.

#### 1.05 CONCRETE WORK

- A. Unless otherwise noted, all concrete material and installation shall be as required in Division 03.
- B. General Trades Contractor shall provide all poured concrete for sanitary work, including pipe encasement, and clean out pads.

#### 1.06 ACCEPTABLE PIPE MANUFACTURERS

- A. Cast Iron Sewer Pipe: Clow or approved equal by American Cast Iron, Tyler, U. S. Pipe & Foundry, or Griffin.
- B. Plastic Sewer Pipe: Gravity sewer: J-M Pipe or approved equal by Yardley or Charlotte.

#### 1.07 COMPLETION

- A. Upon completion, sewers, cleanouts, and oil interceptor shall be left clean and free from rubbish until the acceptance of the Work.



- B. Any repairs or alterations made to the sanitary sewer system after performing the leakage test will require retesting of the section of sewer involved.

## PART 2 PRODUCTS

### 2.01 GRAVITY SEWER PIPE

- A. Under sodden areas or non-traffic areas, use the following:
  - 1. Cast iron sewer pipe:
    - a. Service weight (ASTM A74) with oakum and lead or compression seal gasket joints.
    - b. Hubless (ASTM A74 and CISPI-301) with stainless steel couplings or cast iron Alfa or MG couplings.
  - 2. Plastic sewer pipe option:
    - a. PVC plastic (ASTM D3034), SDR 35 with (ASTM 3212) seals.
    - b. ABS plastic (ASTM D2751).
- B. All fittings shall be compatible with piping for size, material, and joint type.
- C. Cast iron pipe and fittings shall be factory-coated with coal tar enamel.

### 2.02 OIL INTERCEPTOR

- A. OI-1: STRIEM OT-750. High density polyethylene, complete with tappings, vents, manhole extension(s) to finished grade, 750 gallons liquid capacity, 323 gallon oil capacity, 295 gallon solids/sediment capacity, drain 8,300 sq. ft. of floor area minimum, 1 cu. ft. minimum liquid capacity above outlet for each 100 sq. ft. of floor area to be drained into interceptor. Lifetime warranty.
- B. Striem H20 rated pickable cast iron covers.
- C. Interceptor shall comply with County and State requirements.
- D. Other Acceptable Manufacturers: Approved equal by Containment Solutions, Inc., or Xerxes. If manufacturer can supply one tank that meets the total capacity listed above.

### 2.03 EXTERIOR CLEANOUTS

- A. Zurn #Z-1400 HD. Adjustable cast iron body, heavy-duty load rating, cast iron vandal-resistant scoriated cover, threaded ABS plug, line size, caulk outlet.
- B. Other Acceptable Manufacturers: Approved equal by Wade, Jay R. Smith, Josam, or Ancon.

### 2.04 TAPE COATING

- A. Install with 1/2 in. minimum overlap.
- B. Acceptable Manufacturers: Tapecoat Co. "Tapecoat CT," Kendall Co. "Polyken 930," Royston Labs "Greenline," or Republic Steel "X-Tru-Tape #35."

## PART 3 EXECUTION

### 3.01 SITE INSPECTION

- A. Examine the areas and the conditions under which sanitary sewer system work is to be installed and notify the Associate Architect of conditions detrimental to the proper and timely completion of the Work.
- B. Do not proceed with the Work until unsatisfactory conditions have been corrected.

- C. Contractor shall determine the exact location and elevation of any existing pipe it may disturb during earthmoving operations, or which may be affected by its work in any way.

### 3.02 INSTALLATION — SEWER LINE

- A. Install pipe in accordance with the requirements of the State Code Authority, except where more stringent requirements are required by these Specifications.
- B. Inspect piping before installation to detect any apparent defects. Mark defective materials with white paint and promptly remove from the site.
- C. Lay piping beginning at the low point of a system, true to the elevation and alignment indicated, with unbroken continuity of invert.
- D. Place groove or bell end of pipe facing upstream.
- E. Install gaskets in accordance with Manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.
- F. Cast Iron Sewer Pipe: Install in accordance with applicable provisions of the CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
- G. Plastic Sewer Pipe Option: Install in accordance with Manufacturer's recommendations at the elevation, depth, and slope indicated on the Drawings.
- H. Sewer pipe crossing under or over water lines, with less than 18 in. between pipes, shall be water pressure pipe, shall extend a minimum of 10 ft. each side of the water line crossing, shall be laid at least 10 ft. horizontally from water lines, and shall be so arranged that the sewer joints shall be equidistant and as far as possible from the water main. This portion of sewer pipe shall be pressure-tested at 50 PSI for a period of not less than (15) minutes, with no loss in pressure.
- I. Coordinate location, size, and depth of sewer lines with the General Trades Contractor prior to beginning work.
- J. Install pipe tape coating on underground steel piping according to Manufacturer's recommendations.
- K. Cleaning:
  - 1. Clear the interior of all pipe of dirt and other superfluous material. Maintain a swab or drag in the line and pull past each joint as it is completed.
  - 2. Place plugs in the ends of uncompleted pipe at the end of the day or whenever work stops.
  - 3. Flush lines if required to remove collected debris.
  - 4. Upon their completion, sewer pipe, oil interceptor, and cleanouts shall be left clean and free from rubbish until acceptance.
- L. Inspection:
  - 1. Inspect pipe to determine whether line displacement or other damage has occurred.
  - 2. If the inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, take whatever steps are necessary to correct these deficiencies.

### 3.03 INSTALLATION — EXTERIOR CLEANOUTS

- A. Cleanouts shall be installed in center of 18 in. square concrete slab, 6 in. thick. Install cleanout and slab flush with finished grade or pavement.
- B. General Trades Contractor shall provide concrete pads. Edges shall be mitered.

### 3.04 EXCAVATION AND BACKFILL AND RELATED SAFETY REQUIREMENTS

- A. Refer to Section 22 05 05.

- B. Refer to Division 01 for additional requirements.

3.05 TESTING

- A. Perform testing of complete sanitary sewer system in accordance with requirements of the Code Authority Having Jurisdiction.

END OF SECTION 221323

## SECTION 221513 - GENERAL SERVICE COMPRESSED AIR PIPING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 11, "Plumbing Rough-In and Final Connections."
- B. Section 22 15 19, "General Service Packaged Air Compressors and Receivers."

#### 1.03 DESCRIPTION

- A. Provide a complete air distribution system, including outlets, piping, and specialties. Connect to air dryer outlet.
- B. Connect to air-operated equipment where shown on Drawings.
- C. Distribution air pressure shall be 140 PSIG. Confirm exact distribution air pressure with the Owner.
- D. Provide shut-off valve and quick disconnects on air line drops where shown on Drawings.
- E. Confirm exact location of air drops, configurations, valve locations, and quick disconnect size and type with the Owner before installation.
- F. Test complete system.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society for Testing and Material (ASTM).

### PART 2 PRODUCTS

#### 2.01 AIR PIPING

- A. Type "L" hard drawn copper tubing with wrought copper fittings (ASTM B88). OPTION: "T-Drill" mechanically formed connections, brazed joints.
- B. Schedule 40 black steel (ASTM A53CW): 2 in. and smaller: 150 lb. malleable iron threaded fittings (ASTM A47).

#### 2.02 SOLDER AND BRAZING ALLOYS

- A. Solder: 95-5 Tin-Antimony (ASTM B32).
- B. Copper Brazing Alloys: Silver/phosphorus or silver/zinc alloys having a melting point greater than 1,000 deg. F. (ANSI B 31.1).
  - 1. Sil-Fos filler as manufactured by Handy Harmon.
  - 2. Aircosil filler as manufactured by Airco Welding Products.
  - 3. Stay-Silv filler as manufactured by Harris.

2.03 VALVES

- A. Ball Valves, 2 in. and smaller: Milwaukee “Butterball” Model BB2-100 or BB2-350. 150 lb. SWP, bronze body, Viton seat, threaded or solder joint ends, full port, stainless steel disc and stem, and lever handle.
- B. Check Valves, 2 in. and smaller: Nibco No. T-413 or S-413. 200 lb. WOG, bronze body, horizontal swing, and threaded or solder joint ends.
- C. Other Acceptable Manufacturers: Approved equal by Nibco, Jenkins, Apollo, Keystone, Powell, Crane, Lunkenheimer, Milwaukee, Walworth, or Watts.
- D. Each type valve shall be by same Manufacturer.

2.04 CENTRIFUGAL SEPARATOR

- A. Kaeser Model KFS-60. High-efficiency in-line separator with separator core and glass fiber filter.

2.05 AIR DRIP TRAPS

- A. Armstrong No. 71-A. Snap-action, 3/4 in. connection.
- B. Other Acceptable Manufacturer: Approved equal by Spirax/Sarco or Hoffman.

2.06 REGULATORS

- A. 3/4 in.: Aro Model 27354-200. Adjustable 10 PSI to 250 PSI range. Aro Model 29077: L type mounting bracket (where required).
- B. Pressure gauge: Aro Model 100083. 0 PSI to 300 PSI range.
- C. Install filter upstream of regulator.
- D. Other Acceptable Manufacturers: Approved equal by Arco, Honeywell Braukmann, A. W. Cash, Cla-Val Co., Parker Hannifin, Lincoln, Wilkerson, Wilkins or Graco.

2.07 FILTERS

- A. 3/4 in.: Aro Model 25351-221. 10 oz. plastic bowl with guard, automatic mechanical drain, and 5 micron filter element.
- B. Other Acceptable Manufacturers: Approved equal by Arco, Balcrank, Hankison, Parker Hannifin, Lincoln, Milton, or Wilkerson.

2.08 OIL LUBRICATORS

- A. 3/4 in.: Aro Model L26451-110. 32 oz. oil capacity metal bowl with sight glass, and 190 SCFM air flow rating at 90 PSIG.
- B. Other Acceptable Manufacturers: Approved equal by Arco, Balcrank, Parker Hannifin, Lincoln, Milton, Wilkerson or Graco.

2.09 OPTION TO FURNISHING SEPARATE ITEMS: FILTER / REGULATOR / LUBRICATORS

- A. 3/4 in.: Aro Model 28358. Pre-assembled filter, regulator, lubricator, and pipe nipple for end-of-line installations.

2.10 FLEXIBLE CONNECTORS

- A. Flexonics 401M Series. Stainless steel hose and braid, 250 deg. F. rating, threaded or solder ends, and flange ends where required.
- B. Other Acceptable Manufacturers: Approved equal by Anaconda, Keflex, Metraflex, Proco or Graco.

## 2.11 QUICK COUPLERS

- A. Parker 20 Series, Model 25-F. Steel, 1/2 in. female pipe thread, 3/8 in. body. Verify body size and type with the Owner before ordering. Provide (1) companion male quick coupler per female quick coupler to the Owner.
  - 1. Other Acceptable Manufacturers: Approved equal by Aero, Aeroquip, Aro, Balcrank, Breco, Dyna-Quip, Foster, Hansen, Hoffman, Lincoln, Milton, Schrader or Graco.

## 2.12 STRAINERS

- A. Y-Pattern: Armstrong No. AISC. Semisteel body, stainless steel screen, and threaded ends. Provide drain valve on strainer.
- B. Basket: Armstrong. Bronze body, Monel screen, and threaded ends. Provide drain valve on strainer.
- C. Other Acceptable Manufacturers: Anderson, Crane, Wilkins, Spirax/Sarco, or Watts.

## PART 3 EXECUTION

### 3.01 COORDINATION

- A. Coordinate piping with beams, cranes, crane rails, joists, walls, lights, HVAC piping, ductwork, equipment, and electrical equipment.
- B. Coordinate rough-in requirements of equipment with the Owner.
- C. Coordinate installation height of shut-off valves and quick couplers on air drops with the Owner, A/E, all trades and equipment.
- D. Coordinate type and size of quick couplers with the Owner.

### 3.02 INSTALLATION

- A. Slope air lines 1 in. to 40 ft. down toward air drip. Provide air drips at all low points. Drip shall consist of a valve and air drip trap, terminated at 4 ft. above floor on nearest acceptable wall, with valve installed as high as possible on drop.
- B. Make all branch connections off of top of main supply line.
- C. Secure air line drops to wall or structure.
- D. Install shut-off valves to facilitate maintenance of the system.
- E. Terminate air drops at 4 ft.-0 in. above floor slab, unless otherwise noted.
- F. Install a valve to shut off the air service at each branch off the main, and at each individual fixture and equipment not having a built-in shut-off valve.
- G. Provide a valve, dirt leg, filter, regulator, and lubricator on air-operated equipment feeds where shown on Drawings.
- H. Install valve and strainer ahead of each filter regulator.
- I. Install valve, dirt leg filter, and quick coupler at each air drop in shop area where shown on Drawings.
- J. Install shut-off valve, union, and dirt leg at each final connection to equipment.
- K. Install oil lubricator downstream of filter at each quick coupler.
- L. Fill all oil lubricators with oil, per Manufacturer's recommendations.

- M. Inside of piping and fittings shall be cleaned out with approved solvent according to Manufacturer's recommendations.
- N. Provide quick couplers on air line drops where shown on Drawings.
- O. Connect to hose reels per Manufacturer's recommendations. Reels provided by this Contractor.

3.03 TESTS

- A. Perform tests before concealing any pipe.
- B. Test compressed air piping at 225 PSIG for (6) hours with no pressure drop.
- C. Should leaks occur, remove the defective sections of pipe and/or defective fittings and replaced them with new materials.
- D. Repeat test until no defects occur.
- E. The date(s) and result(s) of tests shall be recorded, witnessed, and submitted to the A/E.

END OF SECTION 221513

SECTION 221519 - GENERAL SERVICE PACKAGED AIR COMPRESSORS AND RECEIVERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 05 12, "Plumbing Vibration Isolators."
- B. Section 22 15 13, "General Service Compressed-Air Piping."

1.03 DESCRIPTION

- A. Provide an air compressor and refrigerated air dryer where shown on Drawings.

1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American Society of Mechanical Engineers (ASME).
  - 2. Underwriters Laboratories Label (UL).

1.05 MAXIMUM DUTY CYCLE

- A. Unit shall have sufficient capacity and designed to limit compressor operation to 25% duty cycle.

1.06 RATINGS AND CAPACITY

- A. Refer to Drawings for standard cubic feet per minute, outlet pounds per square inch gauge, tank gallonage, horsepower, and electrical requirements.

1.07 START-UP SERVICE

- A. Compressor Manufacturer shall provide a factory-trained Representative to start up, adjust, and prepare the compressor for final operation.

PART 2 PRODUCTS

2.01 AIR COMPRESSOR

- A. AC-1: Champion Model VR15F-12. 2-cylinder, 15 HP motor, 230 volts, 3-phase, 1,045 RPM, 49.0 CFM at 175 PSI delivery, 120 gallon vertical ASME receiver tank, complete with compressor, motor, and accessories.
  - 1. Accessories:
    - a. Air-cooled after-cooler.
    - b. Air intake silencer-filter.
    - c. Full-time low oil level shutoff control with manual reset to prevent restarting while oil is being added.
    - d. OSHA-approved, totally enclosed belt guard.
    - e. Compressor-mounted magnetic starter with thermal overload protection.
    - f. Pressure switch. Set pressure switch for 140 PSI.
  - 2. Other Acceptable Manufacturers: Ingersoll-Rand or Emglo.



PART 3 EXECUTION

3.01 COORDINATION

- A. Coordinate location of air compressor with all equipment.

3.02 INSTALLATION

- A. Install and shim air compressor to level.
- B. Install air compressor assembly on concrete pad provided by this Contractor.
- C. Perform installation and start-up of air compressor in the presence of Manufacturer's Representative.
- D. Pipe the automatic and manual drain of compressor's air receiver tank, to nearest floor drain inlet.

3.03 WIRING

- A. Provide disconnect switches and power wiring of air compressor.

END OF SECTION 221519

## SECTION 223300 – ELECTRIC DOMESTIC WATER HEATERS

### 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. Light-commercial electric water heaters.
  - 2. Water heater accessories.

#### 1.3 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.
- D. Warranty.

#### 1.4 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. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

#### 1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including storage tank and supports.

- b. Faulty operation of controls.
  - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Period(s): From date of Substantial Completion:
- a. Commercial Electric Water Heaters: Three years.

## 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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 LIGHT-COMMERCIAL ELECTRIC WATER HEATERS

- A. Description: Comply with UL 174 for household, storage electric water heaters.
- 1. Manufacturers:
    - a. American Water Heater Company.
    - b. Bradford White Corporation.
    - c. Electric Heater Company (The); Hubbell Heaters Division.
    - d. GSW Water Heating Company.
    - e. Heat Transfer Products, Inc.
    - f. Lochinvar Corporation.
    - g. Rheem Water Heater Div.; Rheem Manufacturing Company.
    - h. Ruud Water Heater Div.; Rheem Manufacturing Company.
    - i. Smith, A. O. Water Products Company.
    - j. State Industries, Inc.
  - 2. Storage-Tank Construction: Steel, vertical arrangement.
    - a. Tappings: ASME B1.20.1 pipe thread.
    - b. Pressure Rating: 150 psig.
    - c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
  - 3. Factory-Installed Storage-Tank Appurtenances:
    - a. Anode Rod: Replaceable magnesium.
    - b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.

- c. Drain Valve: ASSE 1005.
  - d. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
  - e. Jacket: Steel with enameled finish.
  - f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
  - g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation, unless otherwise indicated.
  - h. Temperature Control: Adjustable thermostat for each element.
  - i. Safety Control: High-temperature-limit cutoff device or system.
  - j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
4. Special Requirements: NSF 5 construction with legs for off-floor installation.

### 2.3 WATER HEATER ACCESSORIES

- A. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches above the floor.
- B. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.
- C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.
- D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.
- E. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig- maximum outlet pressure, unless otherwise indicated.
- F. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

## PART 3 - EXECUTION

### 3.1 WATER HEATER INSTALLATION

- A. Install commercial water heaters on concrete bases.
  - 1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
  - 2. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

- C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.
- E. Install thermometer on outlet piping of water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.
- F. Install water regulator, with integral bypass relief valve, in booster-heater inlet piping and water hammer arrester in booster-heater outlet piping.
- G. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- H. Fill water heaters with water.

### 3.2 CONNECTIONS

- A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 FIELD QUALITY CONTROL

- A. Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections.
- B. Perform the following field tests and inspections:
  - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

### 3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 223300

## SECTION 223400 – FUEL-FIRED, DOMESTIC-WATER HEATERS

### 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. Gas-fired, tankless, domestic-water heaters.
  - 2. Domestic-water heater accessories.

#### 1.3 SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
  - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.
- G. Warranty: Sample of special warranty.

#### 1.4 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/IESNA 90.1 Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.
- C. ASME Compliance:
  - 1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

## 1.5 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
  - a. Structural failures including storage tank and supports.
  - b. Faulty operation of controls.
  - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Periods: From date of Substantial Completion.
  - a. Gas-Fired, Tankless, Domestic-Water Heaters:
    - 1) Heat Exchanger: Five years.
    - 2) Controls and Other Components: Three years.
    - 3) Controls and Other Components: Three years.

## PART 2 - PRODUCTS

### 2.1 GAS-FIRED, TANKLESS, DOMESTIC-WATER HEATERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Bosch Water Heating.
  2. Bradford White Corporation.
  3. NORITZ America Corp.
  4. Rheem Manufacturing Company; Rheem Water Heating.
  5. Rinnai Corporation.
  6. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
  7. State Industries.
- B. Standard: ANSI Z21.10.3/CSA 4.3 for gas-fired, instantaneous, domestic-water heaters for indoor application.

- C. Construction: Stainless Steel and Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.
  - 1. Tappings: ASME B1.20.1 pipe thread.
  - 2. Pressure Rating: 150 psig.
  - 3. Heat Exchanger;
    - a. Primary: Copper tubing.
    - b. Secondary (condensing): Stainless Steel tubing.
  - 4. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
  - 5. Jacket: Metal, with enameled finish, or plastic.
  - 6. Burner: Modulating, for use with tankless, domestic-water heaters and natural-gas fuel.
  - 7. Automatic Ignition: Manufacturer's proprietary system for automatic, gas ignition.
  - 8. Temperature Control: Adjustable electronic thermostat.
  - 9. Operation: Sealed combustion with induced draft fan
  - 10. Safety controls: Flame Rod, Thermal Fuse, Lightning Protection (ZNR), Overheat sensor, Freeze protection heater, fan rotation sensor, Neutralizer Overfill Sensor.
- D. Support: Bracket for wall mounting.

## 2.2 DOMESTIC-WATER HEATER ACCESSORIES

- A. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90. or ASHRAE 90.2.
- B. Heat-Trap Fittings: ASHRAE 90.2.
  - 1. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- C. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.
- D. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 1/2-psig pressure rating as required to match gas supply.
- E. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.
- F. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
  - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
- G. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.
  - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.



- H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.
- I. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

### 2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Division 01 Section "Quality Requirements" for retesting and reinspecting requirements and Division 01 Section "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Tankless, Domestic-Water Heater Mounting: Install tankless, domestic-water heaters at least 18 inches above floor on wall bracket.
  - 1. Maintain manufacturer's recommended clearances.
  - 2. Arrange units so controls and devices that require servicing are accessible.
  - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 5. Anchor domestic-water heaters to substrate.
- B. Install domestic-water heaters level and plumb, according referenced standards and manufacturer's requirements. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
  - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- C. Install gas-fired, domestic-water heaters according to NFPA 54.
  - 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
  - 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
  - 3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.

4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Division 23 Section "Facility Natural-Gas Piping."
- D. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Division 22 Section "Domestic Water Piping Specialties."
- F. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Division 22 Section "Meters and Gages for Plumbing Piping."
- G. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

### 3.2 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Division 22 Section "Domestic Water Piping."
- B. Comply with requirements for gas piping specified in Division 22 Section "Facility Natural-Gas Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

### 3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

### 3.4 FIELD QUALITY CONTROL

- A. 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.
  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 operation.
  4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Division 01 Section "Quality Requirements" for retesting and reinspecting requirements and Division 01 Section "Execution" for requirements for correcting the Work.
- C. Prepare test and inspection reports.

END OF SECTION 223400

## SECTION 224200 - COMMERCIAL PLUMBING FIXTURES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 07 19, "Plumbing Piping Insulation."
- B. Section 22 11 16, "Domestic Water Piping."
- C. Section 22 13 16, "Sanitary Waste and Vent Piping."
- D. Section 22 45 00, "Emergency Plumbing Fixtures."
- E. Section 22 47 00, "Bottle Fillers."

#### 1.03 DESCRIPTION

- A. Provide plumbing fixtures installed in place, complete with supports, supply, and waste trim as indicated on the Drawings.
- B. All fixtures shall have vandal-resistant handles, aerators, escutcheons, carriers, nuts, and bolts.
- C. All trim and exposed piping shall be chrome-plated, unless noted otherwise.
- D. Faucets shall have ceramic disc valve cartridges or cam-activated diaphragm valve cartridges.
- E. Exposed metal parts shall be nonferrous and chrome-plated, unless otherwise noted. Vitreous china or enamel fixtures and trim shall be free of defects. Plumbing fixtures shall be white in color, unless otherwise noted.
- F. All plumbing fixtures shall be of commercial quality and free of defects.
- G. Provide trim, fittings, carriers, angle stops, chrome water supply piping, and all accessories required for a complete installation.
- H. Fixture connection sizes are shown on Drawings.
- I. All vitreous china plumbing fixtures resting against a wall or floor shall have ground mating surfaces and shall be caulked with silicone sealant of a color to match the fixture. Remove excess material after fixture installation.
- J. Provide a 1/4 in. bead of caulk or silicone sealant around the perimeter of casework openings for all countertop fixtures. Remove excess material after fixture installation.
- K. Water closet flush valve handle shall be left-handed operation, unless required to be right-handed operation to comply with ICC A117.1 and ADA Guidelines. Flush valve trip lever shall be mounted on the wide side of the water closet stall.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society of Sanitary Engineering (ASSE).
  - 3. International Code Council (ICC) A117.1, "Accessible and Usable Buildings and Facilities."

4. 2010 ADA Standards for Accessible Design
5. Architectural Barriers Act (ABA) Accessibility Guidelines.
6. City and State Plumbing and Energy Codes.
7. Federal Energy Policy Act of 1992:
  - a. Water Closets: 1.6 gallon/flush maximum.
  - b. Public Lavatories: 0.5 gpm maximum.
8. National Electrical Manufacturers Association (NEMA) .
9. National Sanitation Foundation (NSF).
10. Plumbing and Drainage Institute (PDI).
11. Underwriters Laboratories, Inc., (UL) .

#### 1.05 SUBMITTALS

- A. Submit Manufacturer's product data for all products specified in this Section and shown on Drawings.
- B. Each Shop Drawing submittal shall be clearly marked with model number and fixture designation number and shall indicate all required accessories, dimensions, construction, color, and rough-in requirements. Submit color charts when required.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Fixtures and trim shall remain crated and stored until installation to prevent physical damage and moisture and dirt contamination. Adequately protect installed fixtures from damage with cardboard, plywood, or other rigid material.
- B. The Contractor shall not permit the use of installed plumbing fixtures by construction personnel without the Owner's written permission. Any of the installed fixtures, fittings or trim found damaged prior to final acceptance shall be removed and replaced by the Contractor at no extra charge to the Owner.

### PART 2 PRODUCTS

#### 2.01 PLUMBING FIXTURES AND ACCESSORIES

- A. Acceptable Fixture Manufacturers:
  1. Vitreous China Fixtures: American Standard, Kohler, Eljer, or Crane.
  2. Urinal: Sloan, Kohler, or American Standard.
  3. Wash fountain: Bradley, Acorn Sanispray, Intersan, or Willoughby.
  4. Food Waste Grinder: In-Sink-Erator, Hobart, Kitchen-Aid, Waste King, or Master.
  5. Mop Service Basin: American Standard, Fiat, Powers, Standard Elsmere, Stern Williams, Mustee, Florestone, Swan, Creative Industries, Zurn, or Ceco.
  6. Sinks: Elkay, Just, American Standard, Mustee.
- B. Acceptable Accessory Manufacturers:
  1. Flush Valves (with vandal-resistant stop): Sloan, Delany, or Zurn.
  2. Water Closet Seats: Beneke, Church, Kohler, Bemis, Olsonite, Centoco, or Sperzel.
  3. Faucets: Chicago Faucet, American Standard, Elkay, Kohler, Eljer, Crane, T & S Brass Company, Grohe, Speakman, Moen, Zurn, Delta, Sloan, or Symmons.
  4. Supplies, Escutcheons, and Traps: Brasscraft, Bridgeport, Consolidated, Frost, Waterway, McGuire Mfg. Co., Dearborn, Sanitary-Dash, Speedway, Zurn, or Anso-Flex.

#### 2.02 CARRIERS

- A. All carriers shall be specifically chosen to accommodate the particular brand and style of fixture actually installed, the particular type of floor and wall actually present at each fixture location, and

the piping arrangement at each fixture. Furnish plastic or metal positioning frames to isolate carrier bolts from wall construction.

- B. Provide a heavy-duty, rectangular vertical support, floor-supported, commercial type fixture carrier for each wall-mounted plumbing fixture, unless noted otherwise.
- C. Water Closets: Zurn Model Z1203 or Z1204. Floor-supported, with buttress foot and foot anchor, rear foot support, flush valve supply support, cast iron, commercial type. Coordinate location of carrier closely with the A/E.
- D. Urinals: Heavy-duty type Zurn Model Z1222.
- E. Other Acceptable Manufacturers: Approved equal by Jay R. Smith, Wade, or Josam.

### 2.03 WATER CLOSETS

- A. WC-1: (ICC A117.1 and ADA-compliant, floor-mounted, flush valve, back outlet): American Standard Model 3695.001, low consumption, 1.6 GPF, siphon jet, elongated bowl, vitreous china, with bolt caps, and 1-1/2 in. top spud.
  - 1. Seat: American Standard 5901.110. Commercial-grade, open front, extra heavy-duty, solid white, flame-retardant polypropylene plastic, with self-sustaining check hinge, integral molded bumper, and no cover.
  - 2. Flush valve: American standard model 6047.161.002. Chrome with 1 in. screwdriver angle stop, Dual-Flush, adjustable tailpiece, vacuum breaker, and chrome metal escutcheon plate.
    - a. Shorten flush valve outlet tube to allow clearance under grab bar for flush valve servicing.
    - b. Conform to ICC A117.1 and ADA Accessibility Guidelines concerning location of flush valve trip lever.

### 2.04 URINALS

- A. UR-1 (ICC A117.1 and ADA-compliant, wall-mounted, back outlet): American standard 6501.010. Vitreous china, 2 in. back outlet. 3/4" top inlet spud.
  - 1. Carrier: Provide heavy-duty carrier.
  - 2. Provide manual flush valve.
- B. Carrier: Provide heavy-duty carrier. Install at handicapped height.

### 2.05 LAVATORIES

- A. LAV-1: American Standard model 355.012. Description: Accessible, wall-mounting, vitreous-china fixture.
  - 1. Supplies: NPS 3/8 chrome-plated copper with stops.
  - 2. Faucet : CHICAGO # 895-317RGD2, 5-3/8" GOOSENECK 4"C.C. W/ 4" BLADE HANDLES
  - 3. Drain: Chicago Faucet Chrome grid, 1 1/4 in. chrome 17 ga. tailpiece, chrome cast brass trap with cleanout plug, and chrome 17 ga. drain to wall.
  - 4. Drain Piping: NPS 1-1/4 chrome-plated, cast-brass P-trap;, 0.032-inch- thick tubular brass waste to wall; and wall escutcheon.
  - 5. Escutcheon plates: Chrome metal supply and waste.

2.06 SINKS

- A. SK-1: Elkay “Lustertone,” Model LR-3319. Countertop, 18 ga. stainless steel, 33 in. x 19-1/2 in. x 6.5 in. deep, double compartment, each 14 in. x 14 in. x 6.5 in. deep, 3-hole punching, #3 finish, and undersides fully undercoated.
1. Faucet: American standard model 7231. Brass gooseneck spout, 2.2 GPM aerator, and chrome water supply piping with wheel angle stops.
  2. Food waste grinder: In-Sink-Erator Model PRO ES. Install in drain opening in left compartment. Stainless steel grinding chamber, sound-insulated, stainless steel shredder and impeller, overload protection, 3/4 HP, 120 volts, listed and labeled by Underwriters Laboratories, Inc. (UL).
  3. Drain: Elkay Model LK-35. Strainer, 1-1/2 in. chrome 17 ga. tailpiece, chrome cast brass trap with cleanout plug, and chrome 17 ga. drain to wall.
  4. Escutcheon plates: Chrome metal supply and waste.
  5. Coordinate size of sink with the Casework Contractor before ordering sink. Install sink in countertop and casework.

2.07 LAUNDRY SINK

6. LS-1: Fiat Model FL-1. Molded stone, 20-1/4 in. x 17-1/4 in. x 13 in. high, 3 in. outlet.
  - a. Faucet: Chicago Faucet Model 897. Service sink faucet at 3.0 GPM, bucket hook, hose end rigid spout with top wall brace, vacuum breaker, lever handles, stops in shanks, rough chrome-plated. Mount faucet at 36 in. above finished floor.
  - b. Strainer: Fiat Model 1453-BB.
  - c. Hose and hose bracket: Fiat Model 832-AA.

PART 3 EXECUTION

3.01 COORDINATION

- A. Coordinate exact location and installed height of plumbing fixtures with the A/E and all trades.
- B. Coordinate mounting height of all fixtures and controls with A/E mounting height diagram. Refer to 2009 ICC A117.1 and 2010 ADA Standards for Accessible design.
- C. Before ordering countertop fixtures and proceeding with rough-in work, coordinate countertop fixture selection with approved millwork shop drawings and the General Trades Contractor.

3.02 INSTALLATION

- A. Install fixtures and trim according to Manufacturer’s recommendations.
- B. Wall-mounted fixtures shall be mounted at the following heights or according to Manufacturer’s recommendations, unless noted or directed otherwise:

Accessible-Compliant Water Closet	17 min. to 19 in. max. to top of seat
Wall-Mounted Urinal	24 in. to lip.
Accessible-Compliant Urinal	17 in. max. to lip.
- C. Install fixture carriers and accessories on wall-mounted fixtures, such as water closets and urinals. Carriers shall be anchored securely to floor.
- D. Review approved millwork shop drawings from the General Trades Contractor. Coordinate location and size of countertop fixtures, casework and openings before proceeding with rough-in work.
- E. Chrome-plated brass escutcheons shall be installed on waste and supply piping at walls, including piping located inside cabinets.

- F. Insulate domestic water supplies and drain piping that could come in contact with wheelchair occupants. Refer to Section 22 07 19.
- G. Provide stops on all cold and hot water supplies to fixtures.
- H. Fixtures shall be carefully assembled and connected to the required plumbing inlets and outlets, and tested so the fixtures will function correctly when the Work is completed.
- I. Provide anchors and supports behind walls and chases for flush valve supply piping.
- J. Self-sustaining water closet seats shall be field adjusted to self-sustain in any position.
- K. Adjust hot water temperature of 105 deg. F. MAXIMUM.
- L. After the installation of the plumbing fixtures and trim is completed, all connecting pipes shall be flushed out through the fixtures to eliminate scale. Clean faucet strainers. Refer to Section 22 11 16 for information on sterilization of water lines.
- M. Provide all required seals, gaskets, nuts, bolts, and washers.
- N. All fixtures shall be thoroughly cleaned of paper and dirt before final acceptance.
- O. Adjust self-closing faucets for closing time of (8) seconds.
- P. Adjust pressure of wash fountain spray.

3.03 WIRING

- A. Provide power wiring and wall switch for food waste grinder.

END OF SECTION 224200





## SECTION 224500 - EMERGENCY PLUMBING FIXTURES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 11 16, "Domestic Water Piping."
- B. Section 22 11 19, "Domestic Water Piping Specialties."

#### 1.03 DESCRIPTION

- A. Provide emergency plumbing fixtures installed in place, complete with supports, supply, and waste trim as indicated on the Drawings.
- B. All fixtures shall have vandal-resistant handles, aerators, escutcheons, nuts, and bolts.
- C. All trim and exposed piping shall be chrome-plated, unless noted otherwise.
- D. Exposed metal parts shall be nonferrous and chrome-plated, unless otherwise noted.
- E. All emergency fixtures shall be of commercial quality and free of defects.
- F. Provide trim, fittings, and all accessories required for a complete installation.
- G. Fixture connection sizes are shown on Drawings.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society of Sanitary Engineering (ASSE).
  - 3. International Code Council (ICC) A117.1, "Accessible and Usable Buildings and Facilities."
  - 4. Americans with Disabilities Act (ADA) Accessibility Guidelines.
  - 5. State Plumbing and Energy Codes.
  - 6. National Electrical Manufacturers Association (NEMA) .
  - 7. National Sanitation Foundation (NSF).
  - 8. Plumbing and Drainage Institute (PDI).
  - 9. Underwriters Laboratories, Inc., (UL) .

#### 1.05 SUBMITTALS

- A. Submit Manufacturer's product data for all products specified in this Section and shown on Drawings.
- B. Each Shop Drawing submittal shall be clearly marked with model number and fixture designation number and shall indicate all required accessories, dimensions, construction, color, and rough-in requirements. Submit color charts when required.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Fixtures and trim shall remain crated and stored until installation to prevent physical damage and moisture and dirt contamination. Adequately protect installed fixtures from damage with cardboard, plywood, or other rigid material.

## PART 2 PRODUCTS

### 2.01 PLUMBING FIXTURES AND ACCESSORIES

- A. Acceptable Fixture Manufacturers for Emergency Shower and Eye Wash: Guardian, Bradley, Encon, Haws, Speakman, Water Saver, or Western.
- B. Manufacturer and Model Number listed below under other paragraphs of Part 2 shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers listed herein will be permitted, unless specifically excluded.

### 2.02 EMERGENCY SHOWER/EYE WASH AND ACCESSORIES

- A. ESEW-1: Guardian GBF1909-GC-FC20-TMV. Floor-mounted, ICC A117.1 and ADA-compliant emergency shower and eye/face wash. Green ABS plastic shower head with stay-open ball valve with pull-rod and triangular handle, four ABS plastic soft flow eye/face spray with stay-open ball valve with push-flag, stainless steel bowl and thermostatic mixing valve assembly (set outlet temperature for 85 degrees F). Provide 1-1/4 in. water supply and 1-1/2 in. drain. Provide dust cover assembly. Install "Emergency Shower/Eye Wash" identification sign on emergency shower vertical pipe. Unit shall conform to ANSI Z358.1-2014. Secure unit to floor and wall.
- B. MV-1: Thermostatic mixing valve (factory set to 85°F) for single emergency eye or eye/face wash and shower safety station. Unit shall include a built-in cold water bypass, rough bronze finish, solid bimetal thermostat, locking temperature regulator with high temperature limit stop factory set for 90°F, integral check stops, dial thermometer, and surface mounted stainless steel cabinet with door and lock. Unit shall have a flow range of 3 GPM to 38 GPM with a maximum pressure loss of 30 PSI and come with a full 2-year warranty. Unit shall be certified to ASSE 1071. Unit shall be certified to meet Low Lead requirements of wetted surface area containing less than 0.25% lead by weight.

## PART 3 EXECUTION

### 3.01 COORDINATION

- A. Coordinate exact location emergency fixture with the A/E.

### 3.02 INSTALLATION

- A. Install fixtures and trim according to Manufacturer's recommendations.
- B. Fixtures shall be carefully assembled and connected to the required plumbing inlets and outlets, and tested so the fixtures will function correctly when the Work is completed.
- C. After the installation of the emergency fixture and trim is completed, all connecting pipes shall be flushed out through the fixtures to eliminate scale. Refer to Section 22 11 16 for information on sterilization of water lines.
- D. Provide all required seals, gaskets, nuts, bolts, and washers.
- E. Fixture shall be thoroughly cleaned of paper and dirt before final acceptance.

END OF SECTION 224500

## SECTION 224700 – BOTTLE FILLERS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, “General Requirements,” Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 22 07 19, “Plumbing Piping Insulation.”
- B. Section 22 11 16, “Domestic Water Piping.”
- C. Section 22 13 16, “Sanitary Waste and Vent Piping.”

#### 1.03 DESCRIPTION

- A. Provide electric water coolers and drinking fountains installed in place, complete with supports, supply, and waste trim as indicated on the Drawings.
- B. All fixtures shall have vandal-resistant handles, escutcheons, carriers, nuts, and bolts.
- C. All trim and exposed piping shall be chrome-plated, unless noted otherwise.
- D. All electric water coolers and drinking fountains shall be of commercial quality and free of defects.
- E. Provide trim, fittings, carriers, angle stops, chrome water supply piping, and all accessories required for a complete installation.
- F. Fixture connection sizes are shown on Drawings.
- G. All electric water coolers and drinking fountains resting against a wall shall be caulked with silicone sealant of a color to match the fixture. Remove excess material after fixture installation.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society of Sanitary Engineering (ASSE).
  - 3. International Code Council (ICC) A117.1, “Accessible and Usable Buildings and Facilities.”
  - 4. Americans with Disabilities Act (ADA) Accessibility Guidelines.
  - 5. State Plumbing and Energy Codes.
  - 6. Federal Energy Policy Act of 1992.
  - 7. National Electrical Manufacturers Association (NEMA) .
  - 8. National Sanitation Foundation (NSF).
  - 9. Plumbing and Drainage Institute (PDI).
  - 10. Underwriters Laboratories, Inc., (UL) .

#### 1.05 SUBMITTALS

- A. Submit Manufacturer’s product data for all products specified in this Section and shown on Drawings.
- B. Each Shop Drawing submittal shall be clearly marked with model number and fixture designation number and shall indicate all required accessories, dimensions, construction, color, and rough-in requirements. Submit color charts when required.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Fixtures and trim shall remain crated and stored until installation to prevent physical damage and moisture and dirt contamination. Adequately protect installed fixtures from damage with cardboard, plywood, or other rigid material.
- B. The Contractor shall not permit the use of installed fixtures by construction personnel without the Owner's written permission. Any of the installed fixtures, fittings or trim found damaged prior to final acceptance shall be removed and replaced by the Contractor at no extra charge to the Owner.

PART 2 PRODUCTS

2.01 PLUMBING FIXTURES AND ACCESSORIES

- A. Acceptable Fixture Manufacturers: Electric water coolers: Oasis, Aquarius, Elkay, Haws, Sunroc, White-Westinghouse, Halsey-Taylor, or Western.
- B. Acceptable Accessory Manufacturers for Supplies, Escutcheons, and Traps: Brasscraft, Bridgeport, Consolidated, Frost, Waterway, McGuire Mfg. Co., Dearborn, Sanitary-Dash, Speedway, Zurn, or Anso-Flex.
- C. Manufacturer and Model Number listed below under other paragraphs of Part 2 shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers listed herein will be permitted, unless specifically excluded.

2.02 CARRIERS

- A. All carriers shall be specifically chosen to accommodate the particular brand and style of fixture actually installed, the particular type of floor and wall actually present at each fixture location, and the piping arrangement at each fixture. Furnish plastic or metal positioning frames to isolate carrier bolts from wall construction.
- B. Provide a heavy-duty, rectangular vertical support, floor-supported, commercial type fixture carrier for each wall-mounted plumbing fixture, unless noted otherwise.
- C. Water Cooler: Zurn Model Z1225.
- D. Other Acceptable Manufacturers: Approved equal by Jay R. Smith, Wade, or Josam.

2.03 ELECTRIC WATER COOLERS

- A. BF-1: (ADA-compliant, Wall-mounted, bottle filler): Oasis Model PWSMEBF, lead-free waterways, hands free bottle filler with 20 second shutoff, 1-1/2 in. tailpiece, and heavy duty steel frame. Provide chrome cast brass trap with cleanout plug, 17 ga. drain to wall, chrome water supply piping with wheel angle stop, and chrome metal supply and waste escutcheon plates.  
PROVIDE CARRIER

PART 3 EXECUTION

3.01 COORDINATION

- A. Coordinate exact location and installed height of plumbing fixtures with the A/E..
- B. Coordinate mounting height of all fixtures and controls to be used by the physically handicapped. Refer to ADA Accessibility Guidelines.

3.02 INSTALLATION

- A. Install fixtures and trim according to Manufacturer's recommendations.

- B. Wall-mounted fixtures shall be mounted according to Manufacturer's recommendations, unless noted or directed otherwise.
- C. Install fixture carriers and accessories on electric water coolers. Carriers shall be anchored securely to floor.
- D. Caulk between fixture and wall with caulking compatible with the wall finish. Coordinate with A/E.
- E. Chrome-plated brass escutcheons shall be installed on waste and supply piping at walls.
- F. Insulate domestic water supplies and drain piping that could come in contact with wheelchair occupants. Refer to Section 22 07 19.
- G. Provide stop on all cold water supplies to fixtures.
- H. Fixtures shall be carefully assembled and connected to the required plumbing inlets and outlets, and tested so the fixtures will function correctly when the Work is completed.
- I. Plug in unit and adjust bottle filler flow for correct operation and temperature outlet.
- J. After the installation of the plumbing fixtures and trim is completed, all connecting pipes shall be flushed out through the fixtures to eliminate scale. Clean faucet strainers. Refer to Section 22 11 16 for information on sterilization of water lines.
- K. Provide all required seals, gaskets, nuts, bolts, and washers.
- L. All fixtures shall be thoroughly cleaned of paper and dirt before final acceptance.

### 3.03 WIRING

- A. Provide receptacle and power wiring for bottle filler.

END OF SECTION 224700



SECTION 230001 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.
- B. In these Sections, the term "Contractor" shall mean the Contractor performing Work on this Project, unless otherwise noted.
  - 1. For HVAC Work, refer to Division 23, Sections 23 00 00 through 23 99 99 (as included) and applicable Division 01 sections.

1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 05 00, "Common Work Results for HVAC."
- B. Section 23 05 60, "Requirements for Completion of HVAC Work."

1.03 DESCRIPTION

- A. Furnish material, labor, tools, accessories, and equipment to complete and have ready for operation all HVAC systems of this Project as described in these Specifications and as shown on the Drawings.
- B. It is the intent that the HVAC Work be complete in every respect. Installation shall comply with the Latest Enforced Edition of all applicable Codes, Regulations, Rules and Standards (including all interim agreements), unless otherwise noted.
- C. Shop drawings for the installation of a HVAC system shall be submitted and reviewed by the A/E before any HVAC system is installed, enlarged, or extended. Under NO circumstances shall any Work be performed prior to receiving shop drawings reviewed by the A/E.
- D. Use sufficient workers and competent supervisors in execution of this portion of the Work to ensure proper and adequate installation throughout. In the acceptance or rejection of installed HVAC system, no allowance will be made for lack of skill on the part of workers.
- E. Coordinate location of all work with other trades and equipment.
- F. Work includes, but is not limited to, the following:
  - 1. Alternates.
  - 2. Vibration isolators.
  - 3. Systems balancing.
  - 4. HVAC insulation.
  - 5. Temperature controls.
  - 6. Ductwork.
  - 7. Dampers.
  - 8. Exhaust fans.
  - 9. Louvers.
  - 10. Diffusers, registers, and grilles.
  - 11. Filters.
  - 12. Flue vent piping.
  - 13. Fan coil units.
  - 14. Air-cooled condensing units.
  - 15. Radiant heating system.



16. Electric heating units.
17. All work as required by division 01 81 13.13.
18. Temporary heat (indirect-fired only)

1.04 LICENSES

- A. Only a Contractor and craftsmen licensed by the State shall install this HVAC Work.
- B. Obtain all permits, licenses, and certifications required by the Code Authority Having Jurisdiction.

1.05 COMPLETION OF HVAC SYSTEM

- A. The HVAC system shall not be considered complete and acceptable unless, and until, all Code and Governing Agency requirements are satisfied.
- B. Refer to Division 01, Section 23 05 00, and Section 23 05 60 for additional requirements.

END OF SECTION 230001

## SECTION 230500 - COMMON WORK RESULTS FOR HVAC

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 REFERENCE

- A. The General Provisions listed in this Section are in addition to the requirements referenced below. They are not meant to replace them, but they shall supersede any conflicting statements contained elsewhere in the Specifications. Contractor is responsible for the more restrictive requirement between these Division 23 General Provisions and other requirements contained elsewhere in the Specifications.

#### 1.03 ABBREVIATIONS AND SYMBOLS

- A. Titles and abbreviations may be used in these Specifications. Abbreviations may be shown on HVAC Drawings. Refer to the list of abbreviations attached to this Section. Refer also to Division 01, the symbols lists shown on the Drawings, and the 2005 ASHRAE Handbook — Fundamentals, Chapter 37, for further abbreviations. All titles and abbreviations may not necessarily apply to this Work.

#### 1.04 STANDARDS OF QUALITY

- A. Contractor shall provide Work of the highest quality, conforming to the accepted practices and standards of the Trades involved.
- B. Any Law, Code, Standard, or Regulation referred to in other Sections of Division 23 is included in its entirety as a part of these Specifications.
- C. The following Codes apply to this Work:
  - 1. State of Ohio:
    - a. 2011 Building Code.
    - b. 2011 Plumbing Code.
    - c. 2011 Mechanical Code.
    - d. 2011 Pressure Piping Code.
    - e. 2011 Fire Code.
  - 2. National:
    - a. 2014 National Electrical Code.
    - b. Americans with Disabilities Act (36 CFR 1191).
    - c. National Fire Protection Association. Codes as listed in subsequent Specification Sections.
    - d. American Society of Mechanical Engineers Welding Code B31.1.0.
- D. Licensed Contractors shall perform Work as required by State Codes.
- E. Methods and materials shall be certified where noted in the individual Specification Sections.
- F. All equipment and appliances installed on this Project shall bear the label of an Approved Testing Agency and shall be installed in accordance with the Manufacturer's instructions for the labeled equipment and appliances.
- G. All structural steel used on this Project shall be manufactured in the United States, per Ohio Revised Code 153.011.

#### 1.05 CONTRACT DRAWINGS

- A. Drawings are schematic and show approximate locations, general arrangement, and extent of Work. The Contract Drawings are not intended to show every vertical or horizontal offset that may be necessary to complete the systems. Having piping, fittings, and ductwork fabricated and delivered in advance of making actual measurements shall not be sufficient cause to avoid making offsets or other changes as may be necessary to install piping and equipment. Verify exact locations in the field and shall coordinate with all other trades.
- B. The A/E shall approve, in writing, significant deviations from Drawings.
- C. The A/E reserves the right to make minor changes in location that do not require additional labor or material, up to the time of roughing-in, without additional cost. The A/E reserves the right to determine what is “significant” and what is “minor.”
- D. If a conflict occurs between the Drawings and Specifications, immediately submit a written request for an interpretation or clarification from the A/E, who shall determine which interpretation has precedence. Refer to the General Conditions.
- E. Should overlap of work among the Trades become evident, immediately submit a written request for an interpretation or clarification from the A/E, who shall determine which interpretation has precedence. Refer to the General Conditions. In such event, none of the Contractors shall assume that it is relieved of the Work that is specified under its branch unless instructions are received, in writing, from the A/E.

#### 1.06 DEFINITIONS

- A. “Provide”: To furnish, install, and connect to make completely ready for regular operation.
- B. “Furnish”: To supply or deliver to site complete with all required accessories and installation instructions.
- C. “Install: To mount, erect, hang, or fasten in place, and connect to make ready for regular operation.
- D. “Concealed”: Either embedded in masonry or other construction, or installed below floor slab, behind wall furring, within walls, within double partitions, above ceilings, in trenches, in tunnels, or within crawl spaces.
- E. “Exposed”: In full or partial view; not “Concealed” as defined above.
- F. “Accessible Ceiling”: Lay-in ceiling with removable ceiling tiles.
- G. “Piping”: Pipe, fitting, flanges, valves, controls, specialties, hangers, bracing, insulation, and other items required or necessary.
- H. “Ductwork”: Ducts and fittings, dampers, vanes, controls, hangers, bracing, insulation, and other items required or necessary.
- I. “Shall”: Indicates a mandatory requirement.
- J. Refer to additional Definitions in Division 01, and the State Building and Mechanical Codes.

#### 1.07 APPLICABLE CODES, LICENSES, PERMITS, FEES, AND NOTICES

- A. The A/E will submit all Contract Drawings and Specifications to the State of Ohio Department of Commerce, Division of Industrial Compliance, Bureau of Construction Compliance, Department of Health, pay the application fee to secure Plan Approval, and obtain and pay for the Plan Approval Certificate.

- B. Secure and pay for the State building permit (if required), and any ADDITIONAL permits, governmental fees, bonds, licenses, and inspections required for the proper execution and completion of the HVAC Work.
- C. Give notice and comply with all Laws, Ordinances, Rules, Regulations, and lawful orders of the Code Authority Having Jurisdiction bearing on the performance of the HVAC Work.
- D. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, it shall promptly notify the A/E in writing, and any necessary changes will be arranged by the A/E.
- E. If the Contractor performs any Work knowing it to be contrary to such Laws, Ordinances, Rules, and Regulations, and fails to give prior notice to the A/E, the Contractor shall assume full responsibility for, and shall bear all costs associated with, correcting the Work.

#### 1.08 TEMPORARY HEAT

- A. HVAC contractor is to provide temporary heat for the entire building during construction of this project. Temporary heaters must be indirect fired. Direct-fired temporary heaters are not acceptable.

#### 1.09 EXAMINATION OF SITE

- A. Before submitting its Bid, the Contractor should visit the site of the proposed Project. After receipt of Bids, no allowances will be made for lack of knowledge of Project conditions.
- B. Should the Contractor note any discrepancies during the Bidding Period, it shall notify the A/E immediately, in writing, to permit issuance of an Addendum to prevent misunderstandings at a later date.

#### 1.10 UTILITIES AND OUTAGES

- A. Locate and touch all existing utilities prior to construction. Where necessary to make minor relocations to permit installation of the HVAC Work, make all such relocations. Advise the A/E immediately of major conflicts to permit modification of the Contract Documents prior to bidding.
- B. Record the location of all concealed utilities on the Record Drawings.
- C. Coordinate any utility service shutdowns or outages with the A/E and Owner. Conform to all Utility Company requirements. Avoid inconveniencing the Owner. Provide temporary service during the curtailment, if required by the A/E.

#### 1.11 COORDINATION

- A. Consult all Contract Drawings that may affect the location of any equipment, apparatus, piping, and ductwork, and make any other adjustments in location as necessary to secure coordination.
- B. Contractor shall be responsible for the cost of additional engineering work required for changes to the work as shown or described, due to the relocation of items requested by the Contractor.

#### 1.12 RECORD DRAWINGS

- A. Maintain, at the job site, (1) set of the Drawings and Specifications that shall be used exclusively for documenting and recording the exact location of all installed Work. The Drawings and Specifications shall be available for viewing anytime during normal working hours.
- B. Record deviations in locations of concealed piping, valves, equipment, ductwork, and all buried, or concealed, utility services, piping, etc., dimensioned from a fixed control point, including depth of bury, at each change of direction, at each change of slope, and as required for further reference. Minor piping or ductwork variations need not be recorded. Record locations of abandoned piping or ductwork, including exterior lines.

- C. Record all Addendum and Change Order Items.
- D. Add valve tag numbers to Drawings.
- E. Record deviations made necessary to incorporate equipment different from the Design Base equipment.
- F. Contractor shall deliver (1) copy of its Record Drawings to the A/E.

#### 1.13 GUARANTEE

- A. Contractor shall guarantee its equipment, workmanship, and materials for a period of (1) year from the date of Contract Completion. Should defects develop within this period, the Contractor shall, at no cost to the Owner, remedy the defects and reimburse the Owner for all damage to other Work caused either by the defects or as a result of the work of correcting the same.
- B. Refer also to Division 01 and other Specification Sections that define the starting date of the guarantee period, or that discuss either additional warranty requirements, or extended equipment warranties beyond the standard period.

### PART 2 PRODUCTS

#### 2.01 DESIGN BASE MANUFACTURER STANDARD

- A. The Drawings and Specifications are based on the specific equipment requirements and configuration for a Design Base Manufacturer. Design coordination of equipment with the building and with other Trades has been made for this specific Model and Manufacturer of equipment. Where several Manufacturers are listed for an item of equipment or material, the first-named shall be considered the Design Base Manufacturer Standard.
- B. Consideration will not be given to any other Manufacturer that the Contractor proposes to use, unless the Manufacturer has been approved by the A/E and specifically named in the Contract Documents or Addenda thereto.

#### 2.02 OTHER MANUFACTURERS

- A. Any specified Equipment Manufacturer furnished by the Contractor other than the Design Base Manufacturer shall be, in the opinion of the A/E, equivalent in quality, design, features, performance, arrangement, and appearance to that of the Design Base equipment or material, including any special features or requirements.
- B. No consideration will be given to any Manufacturer which the Contractor proposes as an "Approved Equal," unless the Manufacturer has been approved by the A/E during the bid period, and specifically named in the Contract Documents or Addenda thereto.
- C. Recognizing that since no two Manufacturers are "identical," whenever the Contractor elects to furnish specified equipment or material manufactured by other than the Design Base Manufacturer, the Contractor shall be responsible for the cost and coordination of all modifications required to accommodate the elected equipment or material, including any Work of other Trades that might be affected. Where changes to other Trades' Work are required, the Contractor shall include the additional costs of all such Work in its bid.
- D. Where deemed necessary by the A/E, the Contractor shall, at no additional cost to the Owner, prepare new layouts for these other brands of equipment which may have different dimensional or service requirements from the Design Base Manufacturer Standard. Submit these layouts to the A/E for review.

- E. Reimburse the A/E for the cost of any design changes incurred by the A/E in the preparation of revised Drawings or Specifications to accommodate the use of any Manufacturer other than the Design Base Manufacturer.

#### 2.03 ALTERNATIVE MANUFACTURERS

- A. Contractor shall submit information on any proposed equipment or material that it desires to use as an Approved Equal.
- B. If the A/E determines an alternative Manufacturer to be acceptable, it will issue an Addendum adding that Manufacturer to the Specification.

#### 2.04 EQUIPMENT SUITABILITY

- A. All equipment provided shall perform as intended. All items listed shall function properly, and as the Manufacturer intended. Install equipment according to the Manufacturer's recommendations. Properly attach equipment to the floor, wall, or structure. Each item of equipment shall be compatible with all other accessories or hook-ups, including flues, piping, controls, wiring, and other equipment that are not furnished by the equipment Manufacturer, but that are required as an accessory or modification, as necessary to achieve its intended function.

#### 2.05 MISCELLANEOUS ACCESSORIES

- A. Provide any additional adapters, fittings, trim, structural steel angles, channels, Unistrut, brackets, etc., as necessary to securely mount and install all items of equipment specified or shown on the Drawings. All steel installed outside or exposed to moisture shall be hot-dipped galvanized.
- B. These accessories are required even though they may not be shown or detailed on the Drawings.
- C. Installation shall be compatible with the building construction on which the item is to be located.
- D. Verify the type of construction prior to ordering the equipment item, so that all required accessories are included.

#### 2.06 QUANTITIES

- A. Equipment may be referred to in these Specifications, or on the Drawings, as either singular or plural; the Contractor shall verify the exact number of items required to complete its Work.

### PART 3 EXECUTION

#### 3.01 EQUIPMENT PROTECTION

- A. Unless equipment and material can be protectively stored in a manner acceptable to the A/E, it shall not be delivered to the site until the Work is ready to receive it.
- B. Protect all equipment and materials during construction from damage by weather, water, dirt, paint droppings, welding and cutting spatters, and other construction activities.
- C. All materials or equipment stored outside shall be elevated and protectively covered in a secured and locked area.
- D. Store materials and equipment sensitive to weather or construction conditions inside. Where necessary, store sensitive equipment in a heated area.
- E. During construction, cover all motors, bearings, controls, and all other items that are susceptible to damage until they can be installed in place.
- F. Immediately repair or replace damaged equipment or materials to the satisfaction of the A/E and at no additional cost to the Owner.

- G. Contractor shall protect the building and other trades material and equipment from damage caused by its Work. Protect floors from cutting oil and chips.
- H. Use all means necessary to protect materials before, during, and after installation.
- I. Refer also to individual Specification Sections for specialized protection.

### 3.02 EQUIPMENT ACCESS

- A. Locate all units to provide sufficient access to change filters, pull coils, or service other items requiring periodic maintenance. Coordinate with structure and all trades.

### 3.03 CUTTING AND PATCHING

- A. Contractor shall perform all cutting and patching required for installing its own Work except as otherwise noted. Cutting shall be done with such tools and methods so as to prevent unnecessary damage to surrounding areas and equipment. Use rotary drills where the cutting of holes through concrete, brick, plaster, or tile is necessary. All cutting shall be accomplished in a neat and workmanlike manner, acceptable to the A/E. Patching shall be performed in accordance with Section 01 73 29, "Cutting and Patching." Contractors shall not cut through roofing or siding.
- B. No cutting shall be done that will, in any way, reduce the structural strength of the building. Cutting of structural support beams, joists, plates, or other structural members is strictly prohibited without the specific written consent of the A/E and the Structural Engineer. Should such cutting be necessary, consult the A/E and do not proceed further without written approval of the A/E.
- C. Cutting and patching includes remodeling and repairing of previously graveled or paved areas, walks, curbs, sod, floors, etc., as may be required. Saw cuts shall be done in neat, straight lines.
- D. Coordinate drilling, welding, etc. and method of attachment to columns, joists, beams, purlins, etc., with the Structural Engineer and all Trades before proceeding.
- E. Contractor shall coordinate any holes it requires in precast concrete work with all trades during the precast shop drawing process.
- F. In lieu of sleeves in precast concrete work, cut holes after erection of concrete. Verify with the A/E that all openings to be field-cut are in conformance with the Precast Manufacturer's specifications before any cutting or drilling proceeds.
- G. Contractor shall be responsible for patching. Only a qualified Finish Tradesman, skilled in the respective craft required, shall perform patching. Patching shall match adjacent surface construction. Materials and equipment used in the patching work shall comply with requirements of other Sections of this Specification relating to material to be used in construction. All patching shall be accomplished in a neat and workmanlike manner, acceptable to the A/E.
- H. All cutting and patching shall be done promptly, and all repairs shall be made as necessary to leave the entire Work in good condition, including all cutting, fitting, and drilling of masonry, concrete, metal, wood, plaster, and other materials as specified or required for proper assembly, fabrication, installation, and completion of the Work.
- I. Contractor shall provide flashing and repair roofing for HVAC items, including, but not limited to, air intakes, reliefs, exhaust fans, flue vent piping, refrigerant piping, etc.
- J. Contractor shall cut and frame all roof and exterior wall openings in construction as required for HVAC items, including, but not limited to, louvers, air intakes, exhaust fans, flue vent piping, etc.
- K. Contractor shall provide openings (with lintels where needed) for sleeves, piping, ducts, louvers, grilles, panels, lintels, and other similar openings in walls and floors. Refer to Drawings.
- L. Provide all lintels.

- M. Contractor shall repair or replace any roads, sidewalks, or other items that its employees may damage during the performance of this Work.
- N. Refer to Section 01 73 29 for additional requirements.

#### 3.04 PAINTING AND RELATED WORK

- A. shall be responsible for finish painting of walls, ceilings, and other Architectural items in the areas of construction.
- B. Contractor shall repaint any finished areas disturbed by their own cutting and patching. Painting of the patched area shall match color of the adjacent construction in the general area of the patch. The entire wall-to-wall and floor-to-ceiling surface shall be repainted if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up. ALL PAINTING SHALL BE DONE BY A QUALIFIED TRADESMAN SKILLED IN THE CRAFT.
- C. Clean, spot-prime with zinc chromate, and finish equal to the original quality any factory-finished equipment that has rusted, has been damaged, or has deteriorated. The entire surface shall be repainted if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.
- D. All insulation coverings shall be cleaned. If pre-sized insulation is not used, insulation coverings shall be sized if finish painting is required.
- E. Clean, remove rust from, and zinc-chromate prime any HVAC support steel and bare ferrous metal, which is not factory-painted, shop-painted, or galvanized, and which remains exposed to view in the finished areas of the building, including mechanical rooms and storage rooms. Ensure that the prime coat shall be compatible with the finish coat.
- F. Clean, remove rust from, zinc-chromate prime, and aluminum-bronze paint all steel hangers, boxes, straps, and rods, furnished under this Contract, which are not provided with rust-protective finish or are damaged in installation, and which remain exposed to view or are in unfinished and mechanical spaces.
- G. Give a prime coat of paint to ferrous metal installed outside the building that is not factory-painted, shop-painted, or galvanized.
- H. All painting shall conform to the requirements of Section 09 90 00.

#### 3.05 CLEANING

- A. Maintain all work areas in a neat and orderly manner, free of debris. Clean up all occupied travel areas at the end of each shift, or immediately after use for material removed.
- B. It is the intent of the Specifications that all Contractors and Subcontractors do their own cleanup, move materials that are in the way of construction, repair and replace any damage they do, and do any other work of a similar nature which must be done.
- C. Upon completion of Work, thoroughly clean all fixtures, material, and equipment of stickers, dirt, grease, rust, oil, and other foreign matter. Prepare for finish painting, where painting is specified.
- D. Before final acceptance of the work, thoroughly clean all finished surfaces of equipment of dirt and dust and touch up all scratched or damaged surfaces with matching material. Repair dents and marred finishes to the satisfaction of the A/E.
- E. Clean interiors of all enclosures of dirt and debris before installing trim or covers.
- F. Rust spots on any part shall be brushed clean, primed, and painted in kind.
- G. Clean galvanized piping and ductwork in exposed areas with diluted acetic acid.
- H. Clean copper piping in exposed areas with fine emery cloth and solvent.



- I. Clean all gauges, thermometers, traps, dirt legs, strainers, and fittings.
- J. Refer to Division 01 for additional requirements.

### 3.06 TESTS AND INSPECTION

- A. The Contract Documents, Laws, Ordinances, Rules, Regulations (including all interim agreements) or Orders of any Code Authority Having Jurisdiction may require portions of the Work to be inspected, tested or approved.
- B. Arrange for inspection of the Work by the Code Authority having Jurisdiction. Inspections shall be conducted by the following:
  - 1. State of Ohio Department of Commerce, Division of Industrial Compliance, Construction Compliance Section.
  - 2. State of Ohio Department of Commerce, State Fire Marshal Division.
  - 3. Local Fire Department.
- C. Notify the A/E of all scheduled tests and adjustments at least (48) hours before they are scheduled, so that it may witness same. If the Contractor performs any test or adjustment without the A/E present, or without proper notification, it shall perform the test or adjustment a second time, in the presence of the A/E. Coordinate all test schedules with the Owner to minimize inconvenience.
- D. Concealed lines shall be tested and approved before being concealed. If a leak appears during the final test, repair the line and any damage resulting from the leak.
- E. After Work has been completed, but before pipe covering has been applied, test each system as required by other Sections of this Specification. At the test pressures, the circulation shall be free and the piping shall be proven free of leaks.
- F. Secure required certificates of inspection, testing, or approval and include them in the Operating and Maintenance manuals.
- G. Contractor shall bear all costs of such inspections, tests, or approvals.
- H. Should any of the Work be covered up or enclosed prior to completion of all required inspections and approvals, uncover the Work and, after it has been completely inspected and approved, make all repairs and replacements with such materials and workmanship as are necessary to secure the approval of the A/E, and at no additional cost to the Owner.
- I. Furnish all test pumps, gauges, equipment, and personnel required, and test as necessary, to demonstrate the integrity of the finished installation to the approval of the Code Authority Having Jurisdiction and the A/E.
- J. Check each piece of equipment for defects and verify that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

### 3.07 SAFETY

- A. Exercise precaution for the protection of persons and property. Provide guard rails, barricades, enclosures, canopies, passageways, lanterns, warning lights, and other protective safety devices as necessary or required by the Code Authorities Having Jurisdiction, and as required to protect persons and property against accidentally dropped materials or other construction hazards.
- B. In no case shall the Owner or A/E be responsible for construction means, methods, techniques, sequences of procedures, or safety precautions and programs in connection with the Work. The Owner or A/E shall not be responsible for any Contractor's failure to employ proper safety procedures.

- C. Contractor shall be solely responsible for the structural design of all temporary items that it uses in the construction of the building, or that become a permanent part of the building, including, but not limited to, hoisting, shoring for concrete and masonry work, the temporary bracing for structural steel, the shoring of cut earth banks, suspended ceilings, equipment, walls, etc.
- D. Provide protection as may be required to prevent glass breakage. Replace broken glass at no cost to the Owner.
- E. All procedures shall comply with the latest regulations of the Occupational Safety and Health Administration.

3.08 BLOCK COURSE COORDINATION

- A. The mounting heights of items are called out on the Drawings for many items. Adjust equipment mounting heights to accommodate brick or block coursing. Coordinate installation of all items in a masonry wall with the A/E.

3.09 AIR HANDLING PLENUMS

- A. Where space is used for air handling, such as above ceilings and elsewhere, do not install combustible or noxious materials.
- B. All materials shall be listed for use in air handling plenums. All wiring shall be UL 910-listed.

3.10 FACTORY INSTALLATION AND START-UP

- A. For those items of equipment that are to be installed, tested, started up, and certified by a factory-trained Representative, furnish a letter from the Factory to the A/E stating that this service shall be provided for this Project, describing the scope of services to be provided, and disclosing the name of the Representative assigned to provide the required services.

TITLES, ABBREVIATIONS, AND SYMBOLS

&	And	ANSI	American National Standards Institute
@	At		
∠	Angle	APPROX.	Approximately
∅	Diameter	ARCH.	Architect
#	Number	ARI	Air-Conditioning and Refrigeration Institute
∅	Round OR Phase		
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A.	Compressed air	ARR'T.	Arrangement
A.D.	Access door	ASA	Acoustical Society of America
A.D.	Area drain	ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
A.F.F.	Above finished floor		
A.P.	Access panel		
AABC	Associated Air Balance Council	ASME	American Society of Mechanical Engineers
AB.	Above		
ACI	American Concrete Institute	ASSE	American Society of Sanitary Engineers
ACPA	American Concrete Pipe Association	ASTM	American Society for Testing and Materials
ADA	Americans with Disabilities Act		
ADC	Air Diffusion Council	AUTO.	Automatic
AH	Air handler	AV	Acid vent
ALT.	Alternate	AW	Acid waste
ALUM.	Aluminum	AWS	American Welding Society
AMCA	Air Movement and Control Association	AWWA	American Water Works Association

B.D.D.	Backdraft damper	DIM.	Dimension
B.T.	Bath tub	DISCH.	Discharge
B.V.	Backwater valve	DN.	Down
BAL.	Balancing	DPR.	Damper
BFP	Backflow preventer	DR.	Door
BHP	Brake horsepower	DW	Distilled water
BLDG.	Building	DWG.	Drawing
BSBD.RAD.	Baseboard radiation	DWH	Domestic water heater
BSMT.	Basement	DWV	Drain, waste and vent
BTM.	Bottom	E.A.T.c	Entering air temperature
BTU	British thermal unit	E.C.	Electrical Contractor
C.B.	Catch basin	E.S.P.	External static pressure
C.I.	Cast iron	E.T.	Expansion tank
C.O.	Clean out	E.W.T.	Entering water temperature
C/C	Center to center	EA.	Each
C/L	Center line	EFF.	Efficiency
CAB.	Cabinet	ELEC.	Electric OR Electrical
CAP.	Capacity	ELEM.	Element
CEIL./CLG.	Ceiling	ELEV.	Elevation
CFH	Cubic feet per hour	ENGR.	Engineer
CFM	Cubic feet per minute	ENT.	Entering
CGA	Compressed Gas Association	EPA	Environmental Protection Agency
CHEM.	Chemical	EQUIP.	Equipment
CISPI	Cast Iron Soil Pipe Institute	EW	Eye wash
COL.	Column	EWC	Electric water cooler
COMB.	Combination	EXH.	Exhaust
CONC.	Concrete	EXIST.	Existing
COND.	Condensate OR Condenser	EXT.	Exterior
CONN.	Connection OR Connect	F & T	Float and thermostatic
CONST.	Construction	F.	Fan OR Fire
CONTR.	Contractor	F.D.	Fire damper
CONV.	Convactor OR Converter	F.E.	Fire extinguisher
COORD.	Coordinate	F.E.C.	Fire extinguisher cabinet OR Food Service Equipment Contractor
CS	Commercial Standard	F.H.	Fire hydrant
CSA	Canadian Standards Association	F.H.C.	Fire hose cabinet
CU.FT.	Cubic feet	F.H.E.C.	Fire hose/extinguisher cabinet
CUH	Cabinet unit heater	F.V.	Flush valve
D.	Deep	FCC	Federal Communications Commission
D.F.	Drinking fountain	FD	Floor drain
D.L.	Door louver	FDA	Food and Drug Administration
D.M.	Damper motor	FHA	Federal Housing Administration
D.S.	Downspout	FIG.	Figure
DB	Dry bulb	FIN.	Finish
DBL.	Double	FIN.RAD.	Finned radiation
DCW	Domestic cold water	FLEX.	Flexible
DET.	Detail	FLR. / FL.	Floor
DHW	Domestic hot water	FMG	Factory Mutual Global
DHWR	Domestic hot water return	FOR	Fuel oil return
DIA. / Ø	Diameter		
DIFF.	Diffuser		

FOS	Fuel oil supply
FPC	Fire Protection Contractor
FPM	Feet per minute
FT.	Feet
FT.HD.	Feet of head
FURN.	Furnish(ed)
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G	Gas
G.C.	General Contractor
G.I.	Grease interceptor
G.T.C.	General Trades Contractor
GALV.	Galvanized
GEN.	General
GPM	Gallons per minute
GR	Grille
GRAV.	Gravity
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H./HT.	Height
H.P.	High pressure
H.S.	Hair strainer
H'STAT	Humidistat
HAC	Heating and air conditioning
HB	Hose bibb
HHS	United States Department of Health and Human Services
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HORIZ.	Horizontal
HP	Horsepower
HPC	High pressure steam condensate
HPS	High pressure steam
HTG.	Heating
HTR.	Heater
HUD	United States Department of Housing and Urban Development
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HV	Heating and ventilating OR High velocity
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HVAC	Heating, ventilating, and air conditioning
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I.D.	Inside diameter
IEC	International Electrotechnical Commission
ICC A117.1	Accessibility Standard
IN.	Inside OR Inches
IND. U.	Induction unit
IND.	Indirect
INSUL.	Insulation
INT.	Interior
INV.	Invert
INV. ELEV.	Invert elevation
IRI	Industrial Risk Insurers
ISO	International Organization for Standardization
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J.R.	Janitor's receptor

JCAH	Joint Commission for Accreditation of Hospitals
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L.	Length
L.A.T.	Leaving air temperature
L.W.T.	Leaving water temperature
LAB	Laboratory
LAV	Lavatory
LH	Left hand
LPC	Low pressure steam condensate
LPS	Low pressure steam
LV'G.	Leaving
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M.A.	Mixed air
M.O.	Motor operated
MAN. DPR.	Manual damper
MAT.	Material
MAX.	Maximum
MBH	1,000 British thermal units/hour
MECH.	Mechanical
MET./MTL.	Metal
MEZZ.	Mezzanine
MFR.	Manufacturer
MH	Manhole
MIN.	Minimum
MISC.	Miscellaneous
MPS	Medium pressure steam
MS	Motor starter
MSS	Manufacturers Standardization Society
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MTD./MT.	Mounted OR Mount
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N.I.C.	Not in contract
N.T.S.	Not to scale
N2	Nitrogen
N2O	Nitrous oxide
NAECA	National Appliance Energy Conservation Act
NB	National Board of Boiler and Pressure Vessel Inspectors
NCPI	National Clay Pipe Institute
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NO. OR #	Number
NOM.	Nominal

NSF	National Sanitation Foundation	REL.	Relief
O.	Oxygen	REQ'D.	Required
O.A.	Outside air	RH	Right hand
O.D.	Outside diameter	RHC	Reheat coil
O.I.	Oil interceptor	RM.	Room
O.V.	Outlet velocity	RPM	Revolutions per minute
O/C	On center	RTA/C	Rooftop air-conditioning unit
ODH	Ohio Department of Health	RW	Raw water
ODMH	Ohio Department of Mental Health	RWC	Rainwater conductor
ODMR/DD	Ohio Department of Mental Retardation and Developmental Disabilities	S & R	Supply and return
ODOE	Ohio Department of Energy	S	Sink
ODOT	Ohio Department of Transportation	S. DPR.	Smoke damper
ODRC	Ohio Department of Rehabilitation and Correction	S.A.	Shock absorber
ODYS	Ohio Department of Youth Services	S.A.	Supply air
OPG.	Opening	S.F.	Square feet
OPP.	Opposite	S.M., S/M	Sheet metal
OSHA	Occupational Safety and Health Administration	S.P.	Static pressure
OU./OZ.	Ounce	S.S.	Service sink
∅	Phase OR Round	S.S.	Storm sewer
P.D.	Pressure drop	S.S., S/S	Stainless steel
P.I.V.	Post indicator valve	SAN.	Sanitary sewer
P/L	Property line	SB	Shampoo bowl
PDI	Plumbing & Drainage Institute	SD	Shower drain
PEI	Petroleum Equipment Institute	SD	Smoke detector
PLBG.	Plumbing	SECT.	Section
PNEU.	Pneumatic	SHR.	Shower
PRESS.	Pressure	SHT. MT'L.	Sheet metal
PROP.	Propeller	SHT.	Sheet
PRV	Pressure-reducing valve	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
PSF	Pounds per square foot	SPEC.	Specification
PSI	Pounds per square inch	SQ.	Square
PSIG	Pounds per square inch gauge	SQ.FT.	Square feet
PT	Plaster trap	ST	Sound trap
∅	Round OR Phase	STAT	Thermostat
R	Register	STD.	Standard
R.A.	Return air	STL.	Steel
R.D.	Roof drain	STM.	Storm
R/W	Right of way	SUCT./S	Suction
RAD.	Radius OR Radiation OR Radiator	SW	Softened water
RECIRC.	Recirculating	SW.	Switch
REG.	Register	T.W.	Tempered water
REINF.	Reinforced	T'STAT	Thermostat
		TD	Temperature difference
		TEMP.	Temperature
		THERM.	Thermometer OR Thermostat
		TYP.	Typical
		UC	Undercut
		UFC	Uniform Fire Code, International Fire Code Institute
		UH	Unit heater

UL	Underwriters Laboratories, Inc.	W.G.	Water gauge
UR	Urinal	W/	With
UV	Unit ventilator	W/O	Without
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V.	Vent	W/W	Wall to wall
V.T.R.	Vent through roof	WAT.	Water
VAC.	Vacuum	WB	Wet bulb
VC	Vacuum cleaning	WC	Water closet
VCP	Vitrified clay pipe	WH	Wall hydrant OR Water heater
VERT.	Vertical	WO	Waste oil
VIB. ISO.	Vibration isolator	<hr/>	
VSP	Vitrified sewer pipe	XFMR	Transformer
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W.	Width OR Water	YD.	Yard
		YH	Yard hydrant

END OF SECTION 230500



SECTION 230506 - HVAC SUBMITTALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.
- B. All submittals shall adhere to section 013300. In the case of conflicts, the more restrictive shall apply.

1.02 DESCRIPTION

- A. Transmittal form: Use State of Ohio Shop Drawing Transmittal form.
- B. Materials and equipment installed under the HVAC Contract shall meet all the requirements of the Contract Documents, and no materials or equipment shall be ordered or installed until submittals are reviewed and approved by the A/E.
- C. Submit complete copies of the catalog data or shop drawings for each manufactured item of equipment and all components to be used in the Work, including the following:
  - 1. Brand name.
  - 2. Catalog number.
  - 3. Specific performance data.
  - 4. Material description.
  - 5. Ratings.
  - 6. Capacity.
  - 7. Working pressure.
  - 8. Dimensional data.
  - 9. Material gauge or thickness.
  - 10. Wiring diagrams.
  - 11. General type.
- D. Catalog data for equipment reviewed by the A/E shall not take precedence over the requirements of the Contract Documents. Review by the A/E shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with all trades.
- E. When submitted for review, all shop drawings shall bear the Contractor's signed certification of the following:
  - 1. Contractor has reviewed, checked, and approved the shop drawings.
  - 2. Shop drawings have been coordinated with the requirements of the Project and with the provisions of the Contract Documents.
  - 3. Contractor has verified all field measurements, hands of equipment, and construction criteria, materials, catalog numbers, and similar data.
- F. It is understood that the A/E's review is ONLY for conformance with the design concept of the Project and with the Contract Documents and, further, that the A/E is not responsible for the means, methods, sequences, techniques, or procedures of construction, or for safety precautions and programs incidental thereto.



1.03 SHOP DRAWINGS

- A. Indicate arrangement of component parts, physical dimensions, materials, electrical and mechanical service requirements, colors (where required), controls, accessories, capacities, and performance characteristics.
- B. Prior to submitting shop drawings, the Contractor shall stamp and sign its certification that the equipment shown on the submittals meets all the requirements of the Contract Documents. **UNSIGNED COPIES WILL NOT BE REVIEWED.**
- C. Submit (8) copies, unless otherwise noted. Approved shop drawings shall be distributed as follows:

QUANTITY	TO
1	A/E
2	Contractor
2	Supplier
3	Operating and Maintenance Manuals

1.04 CONTRACTOR RESPONSIBILITIES

- A. Completely review Shop Drawings, product data, and samples prior to submission.
- B. Determine and verify the following:
  - 1. Field measurements.
  - 2. Field construction criteria.
  - 3. Catalog numbers and similar data.
  - 4. Conformance with Specifications.
  - 5. Hand of equipment.
  - 6. Quantities and sizes.
- C. Coordinate each submittal with requirements of the Work and the Contract Documents.
- D. Notify the A/E, in writing, at time of submission, of any deviations in the submittals from the requirements of the Contract Documents.
- E. Contractor shall make submittals promptly in accordance with the approved schedule, and in such sequence as to cause no delay either in its Work or in the work of any other trade.
- F. Immediately make any corrections or changes in rejected submittals as required by the A/E and resubmit until accepted.
- G. If the Contractor orders equipment or materials, or begins installation, fabrication, or work prior to return of approved submittals, it shall be “at the Contractor’s own risk.”
- H. When (2) or more articles of the same material or equipment are required, they shall be of the same Manufacturer.
- I. Incorporate Shop Drawings into the Operating and Maintenance Manuals.

1.05 CERTIFICATIONS

- A. Provide:
  - 1. Test Agency results verifying capacities, operating conditions, and power requirements at design conditions.
  - 2. Manufacturer’s statement of compliance with Standards discussed in individual Specification Sections.
  - 3. Equipment labels indicating Certification requirements.
  - 4. Quality standard designations on each unit piece, e.g., each pipe length, pressure vessel, or valve.

5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with.
6. Other Certifications listed in other Sections of the Specifications.

1.06 REQUIRED SUBMITTAL INFORMATION

- A. The items listed below may not be a complete list of required submittals. Submit for approval all items to be provided, whether listed or not.

KEY FOR REQUIRED SUBMITTALS

- A Catalog Cuts/Shop Drawings (9 copies).
- B Operating and Maintenance Manuals (3 copies).
- C Color samples (3 each).
- D Product samples (2 each).
- E Typed statement of material to be furnished.
- F Typed verification of compliance with certification requirements.
- G Test.
- H Coordination Drawings.

(Submit number of copies indicated. If not indicated, submit full quantity of copies previously listed.)

HVAC SUBMITTALS REQUIRED	KEY
Gas-Fired Radiant Heaters and Associated Items.....	A
Electric Heating Units.....	A, C
Fan Coil Units.....	A, C
Condensing Units.....	A
Exhaust Fans.....	A
Grilles, Registers, and Diffusers.....	A, C
Louvers.....	A, C
Dampers.....	A
Flexible Ductwork.....	A
Flexible Duct Connections.....	A
Fire Dampers.....	A
Flue Vent System Components.....	A
Hangers.....	E-4
Vibration Isolators.....	E-4
Insulation.....	E-4
Duct Access Panels.....	A
Sheet Metal Drawings.....	A
Suppliers and Manufacturers List.....	E-4
Temperature Controls Subcontractor.....	E-4
Insulation Subcontractor.....	E-4
Sheet Metal Subcontractor.....	E-4
Test and Balance Subcontractor.....	E-4
Operating and Maintenance Manuals (See Section 23 05 07).....	B-2
Air Balancing Report.....	A
Fan Coil Unit Warranty.....	F-2
Radiant Heater Warranty.....	F-2
Condensing Unit Compressor Warranty.....	F-2

END OF SECTION 230506



## SECTION 230507 - HVAC OPERATING AND MAINTENANCE MANUALS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 01 77 00, "Closeout Procedures."
- B. Section 23 05 60, "Requirements for Completion of HVAC Work."

#### 1.03 DESCRIPTION

- A. Compile Operating and Maintenance Manual upon completion of the Work, and as required for final acceptance by the contracting body. Submit draft of Operating and Maintenance Manual to the A/E for review and approval (90) days before Contract Completion.
- B. Submit final corrected Operating and Maintenance Manual (7) days before Contract Completion.
- C. Upon approval, provide (3) Operating and Maintenance Manuals.

### PART 2 PRODUCTS

#### 2.01 OPERATING AND MAINTENANCE MANUALS

- A. The following items, together with any other pertinent data, shall be included in each Operating and Maintenance Manual. This list is not necessarily complete and shall be used only as a guide. Format of manual to be as follows:
  - 1. Operating and Maintenance Manuals shall be loose-leaf, 3-ring, hardcover binders, no larger than 11 in. wide x 12 in. high. Material shall be typewritten or printed and be fully legible. Each section shall be divided by labeled tabs.
  - 2. Cover:
    - a. Title of Project.
    - b. Date of Project completion.
    - c. Name and address of the Owner.
    - d. Date of submittal.
    - e. Name, postal and email addresses and telephone and fax numbers of the Contractor.
    - f. Name, postal and email addresses and telephone and fax numbers of the A/E.
  - 3. Second Page: Index.
  - 4. First Section: A copy of each shop drawing and approval submittal with an index at the beginning of the section.
  - 5. Second Section:
    - a. A list of all equipment used on the job.
    - b. Parts list with numbers of replaceable items, including sources of supply.
    - c. Manufacturers' and nearest Supply Houses' and Factory Representatives' names, postal and email addresses and telephone and fax numbers.
    - d. Model and Serial numbers of components of systems installed.
    - e. Routine and 24-hour emergency service/repair information:
      - 1) Name, postal and email addresses and telephone and fax numbers of servicing agency.

- 2) Names of personnel to be contacted for service arrangements.
6. Third Section:
- a. Description of systems.
  - b. Manufacturer's literature describing each piece of equipment, including the following:
    - 1) Operating and maintenance instructions.
    - 2) Lubrication instructions.
    - 3) Start-up and shutdown procedures.
    - 4) Routine and emergency servicing instructions.
  - c. Special wrenches, keys, etc.
  - d. Temperature control diagrams.
  - e. List of belt sizes, types, and lengths.
  - f. List of filter sizes and types.
  - g. Copies of all testing and balancing reports.
  - h. Prints of all system wiring and control diagrams.
  - i. All certifications and related information.
  - j. Copies of all written warranties.
  - k. The Owner's receipt of spare parts. Refer to Section 23 05 60.
  - l. Copy of the signed and dated letter from the Owner, stating satisfactory completion of instruction, listing names of personnel instructed, and listing names of persons giving the instruction.
- B. Refer to Section 01 77 00 for additional requirements.

END OF SECTION 230507

## SECTION 230508 - HVAC ELECTRICAL COORDINATION

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 09 33, "Electric and Electronic Control System for HVAC."
- B. Section 26 05 11, "Equipment Hook-Up and Final Connection."
- C. Section 26 05 19, "Low-Voltage Electrical Power Conductors and Cables."
- D. Section 26 05 33, "Raceway and Boxes for Electrical Systems."
- E. Section 26 09 00, "Instrumentation and Control for Electrical Systems."

#### 1.03 DESCRIPTION

- A. Equipment drawing 1,000 watts or more must have a power factor of 85% or greater at rated load conditions. Correct equipment with an operating power factor less than 85% to at least 90% under rated load operating conditions. Contractor furnishing the equipment shall be responsible for power factor correction devices.
- B. Unless noted otherwise, the Electrical Contractor shall provide all wiring required to power, control, monitor, or interlock HVAC equipment.
- C. HVAC Contractor shall supervise all final connections to HVAC and temperature control equipment and devices.

#### 1.04 ALTERNATIVE MANUFACTURER ELECTRICAL REQUIREMENTS

- A. Contractor furnishing the equipment shall compensate the Electrical Contractor for the cost of any additional labor and materials required to wire and hook up equipment other than the Design Base Model and Manufacturer, including installation and wiring of any power factor correction devices furnished by the HVAC Contractor.

#### 1.05 COORDINATION

- A. HVAC Contractor shall coordinate its Work as follows:
  - 1. HVAC ITEMS:
    - a. Condensing Units, Radiant Heaters, and Similar Equipment: Electrical Contractor shall provide disconnect switches, control wiring, interlock wiring, and power wiring.
    - b. Motor-Operated Dampers: Electrical Contractor shall provide disconnect switch, control relay, power wiring, and control wiring.
    - c. Large Exhaust Fans: Electrical Contractor shall provide starters, disconnects, relays, power wiring, and control wiring.
    - d. Wall Exhaust Fan: Shall include integral weatherproof disconnect switch. Electrical Contractor shall provide starter, power wiring, and means of control.
  - 2. TEMPERATURE CONTROL ITEMS:
    - a. Thermostats: Unless specified otherwise, the HVAC Contractor shall provide. Electrical Contractor shall rough-in and provide wiring.

- b. Fan Speed Controllers: HVAC Contractor shall furnish controllers. Electrical Contractor shall install and wire.

## 1.06 QUALITY ASSURANCE

### A. Standards:

1. All electrical equipment shall be listed by Underwriters Laboratories, Inc. (UL) and furnished in accordance with Specification requirements of Division 26, "Electrical." Installation shall comply with 2014 National Electrical Code (NEC).
2. National Electrical Manufacturers Association (NEMA).

## PART 2 PRODUCTS

### 2.01 DISCONNECT SWITCHES

- A. Factory-installed disconnect switches shall be NEMA Type 3R, heavy-duty, disconnect switch within the housing of the equipment, for exterior equipment such as roof exhaust fans, or other NEMA Type as required by NEC.
- B. Refer to Division 26 for acceptable Manufacturers.

### 2.02 MOTOR STARTERS

- A. Factory-Installed Starters: NEMA Size 0 minimum, manual or magnetic as indicated, with selector switch or pushbutton as noted, pilot lights where noted, overloads, auxiliary contacts, fuses, and control power transformer, unless unit being controlled includes integral 24 volt control system.
- B. HVAC Contractor shall provide factory-installed starters only where specifically listed in Division 23 Specification Sections. Electrical Contractor shall provide all other starters.
- C. Refer to Division 26 for acceptable Manufacturers.

### 2.03 MOTOR STARTER HEATERS

- A. Bi-metal, automatic reset.
- B. Acceptable Manufacturers: Allen Bradley, Siemens, Square D, or General Electric.

### 2.04 CONTROL WIRING

- A. Electrical Contractor shall provide all control wiring.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Consult Drawings that may affect location of equipment, conduit, or wiring, and make minor adjustments in locations as necessary to secure coordination.

### 3.02 WIRING

- A. Electrical Contractor shall provide all power and line voltage control wiring, and conduit, regardless of voltage.
- B. This work includes, but is not limited to, control wiring for make-up air units, furnaces, and condensing units, and wiring associated with control panels, electrical thermostats, motorized dampers, radiant heaters, exhaust fans, equipment interlocks, and similar electrical control devices.

- C. Temperature Control System:
  - 1. Unless shown on the electrical drawings, all electrical work performed in the installation of the temperature control system as described in this specification is part of the HVAC Contract Work and shall be in accordance with the 2008 NEC and applicable State Codes.
- D. Refer also to Section 23 09 33 and Section 26 09 00. These Sections may discuss additional control sequences of systems and other wiring requirements.
- E. Electrical Contractor shall run all wiring in conduit. Exception: Wiring operating at voltages less than 30 volts can be run exposed above accessible ceilings. NOTE: All wiring and cables installed in air handling plenums either shall be UL 910-listed, Teflon-coated, with plenum rated ties, or shall be run entirely in conduit.
- F. Low voltage wiring may be run exposed ONLY above accessible lay-in ceilings. Wiring shall be run neatly; perpendicular to walls; away from piping, ductwork, or other construction likely to damage the insulation; and securely clipped or fastened directly to the building structure or supported with bridle rings. Unless otherwise noted, all low voltage wiring shall be installed in conduit at the following locations:
  - 1. Where wiring rises up inside walls.
  - 2. Where wiring is run below floor slab.
  - 3. Where wiring is run through or above inaccessible ceilings or in chases.
  - 4. Where wiring is run below ceilings or in equipment rooms.
  - 5. Where run exposed.
- G. Comply with Section 26 05 19 for all wiring, and with Section 26 05 33 for all conduit.
- H. Wiring installation shall be acceptable to the Code Authority Having Jurisdiction.

END OF SECTION 230508





## SECTION 230512 - HVAC VIBRATION ISOLATORS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 05 29, "Hangers and Supports for HVAC Piping and Equipment."

#### 1.03 DESCRIPTION

- A. Provide a complete vibration isolation system to isolate motorized equipment, piping, ductwork, and appurtenances from the building structure and ceiling construction.

#### 1.04 QUALITY ASSURANCE

- A. Noise levels in various parts of the building shall not exceed the noise criteria recommendations as set forth in the 2005 American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Handbook — Fundamentals, Chapter 7. The midpoint of the range of noise criteria curves shall apply to, and become part of, these Specifications.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Peabody Noise Control or approved equal by Vibration Mountings and Controls, Inc., Kinetics Noise Control, or Mason Industries, Inc.
- B. Manufacturer and Model Number listed under Part 2 shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.
- C. Vibration isolation devices, including auxiliary steel bases and pouring forms, shall be designed and furnished by a single Manufacturer or Supplier.

#### 1.06 SUBMITTALS

- A. The Isolator Manufacturer's submittal shall include drawings showing the complete design for the supplementary bases and a tabulation of the design data on the isolators, including the following:
  - 1. Outside diameter of the springs.
  - 2. Free, operating, and solid heights of the springs.
  - 3. Free and operating heights of the neoprene or fiberglass isolators.
  - 4. Isolation efficiency based on the lowest operating speed of the equipment supported.

### PART 2 PRODUCTS

#### 2.01 VIBRATION ISOLATORS

- A. Pad "F" Mounts: Peabody Noise Control Model KIP. Pre-compressed molded fiberglass isolation pads, neoprene-jacketed and stabilized during manufacture. Pads shall be sized for loading from 40 PSI to 60 PSI. See section 1.05 of this specification for equal manufacturers.
- B. Hanger "H" Mounts: Peabody Noise Control Type SFH or Type SH. Combination spring and fiberglass isolation hangers incorporating 2 in. thick neoprene-jacketed fiberglass inserts in series with spring, all encased in welded steel brackets. The spring shall have a minimum additional

travel of 50% between the design height and the solid height. See section 1.05 of this specification for equal manufacturers.

- C. Inertia "I" Bases: Peabody Noise Control Model CIB. Prefabricated base frame with primer steel perimeter members, recessed isolator brackets, and welded in and tied reinforcing bars. Combination spring and neoprene isolation hangers in series with top and bottom load plate assembly. Fill with concrete. See section 1.05 of this specification for equal manufacturers.

## 2.02 ISOLATOR SCHEDULE

- A. Furnish isolator types as follows (See section 1.05 of this specification for equal manufacturers).:

EQUIPMENT ITEM	PEABODY ISOLATOR
Fans	SFH
Condensing units	KIP
Fan coil units	SFH
Air compressor	CIB

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Steel components shall be phosphatized and painted. All nuts, bolts, and washers shall be zinc-electroplated.
- B. Structural steel bases shall be thoroughly cleaned of welding slag and primed with zinc-chromate or metal etching primer.
- C. All isolators exposed to the weather shall have steel parts PVC-coated or hot-dip-galvanized.
- D. Aluminum components shall be etched and painted.

### 3.02 INSTALLATION

- A. Equipment: All motorized equipment, including motors, fans, and other equipment, shall be either mounted on, or suspended with, vibration isolators.

END OF SECTION 230512

## SECTION 230514 - HVAC FOUNDATIONS AND SUPPORTS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Provide concrete pads and bases and all steel reinforcing bars and mesh.
- B. Contractor shall locate and size concrete supports for its equipment.
- C. Carefully coordinate locations, sizes, and extent of all foundations with the Structural Engineer.
- D. A qualified tradesman shall install all concrete work.
- E. Provide all structural supports between building structural framing members to support major mechanical equipment, including make-up air units, large exhaust fans, and radiant heaters. Provide additional framing for make-up air units, and all radiant heating units. For ductwork, piping, and smaller mechanical equipment items, the Contractor shall provide support steel, attached to building structure.
- F. Provide any other support steel required.
- G. For any variation in supports needed for equipment actually purchased, obtain prior written approval of the A/E. Contractor shall bear all costs of modifications, including redesign costs.
- H. Provide supports between structural members, such as steel angles, channels, Unistrut, etc., as required for proper support.
- I. Provide angles, clips, mechanical fasteners, reinforcement steel, drilling of structure, welding to structure, etc. as needed. Means of attachment shall be approved by the A/E and shall not degrade the structure.

### PART 2 PRODUCTS

#### 2.01 SUPPORT STEEL

- A. Provide standard structural shapes, steel beams, unistrut, standard-weight black steel pipe, or steel angle of adequate size and strength to safely carry the weight of equipment item. Verify size required with the Structural Engineer.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Attach all items of equipment securely to structure, floor, or concrete pad.

#### 3.02 CONCRETE PADS

- A. Concrete pads to be provided by G.C. see spec section 033000.

END OF SECTION 230514



## SECTION 230515 - HVAC SLEEVES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 05 00, "Common Work Results for HVAC."
- B. Section 23 07 00, "HVAC Insulation."

#### 1.03 DESCRIPTION

- A. In Drywall, Masonry, or Concrete Wall Construction:
  - 1. Provide sleeves for piping, refrigerant piping, and duct penetrations
  - 2. Option for above ceiling only: Contractor shall omit block(s) where required for penetrations, and shall provide square-finished opening. Do not omit blocks under bearing points or in fire-rated or smoke-rated walls. Do not omit blocks in walls which serve as sound barriers.
  - 3. Coordinate with the A/E and Structural Engineer.
  - 4. Contractor shall provide openings through metal building walls and roof, and seal watertight.
- B. In precast concrete work, in lieu of sleeves, cut holes after erection of concrete.
- C. Sleeve where pipes and ductwork pass exposed through walls, and where any piping or ductwork passes through smoke-rated or fire-rated separations, equipment room walls, or above-grade floors.
- D. Verify which walls, ceilings, or floors are fire-rated, if any, and provide approved fire-blocking or fire-protective devices as required by Ohio Building Code.
- E. Carefully coordinate and check locations of sleeves immediately before and after each concrete pour and masonry installation.
- F. Sleeves are not required in floor slabs on grade or in core-drilled openings not requiring waterproofing or fire suppression. Exception: Sleeves are required at core drilling through hollow core pre-cast slabs and through concrete block walls, to facilitate containment of required fire-stopping material.
- G. Sleeving with absolutely watertight seal is required for piping passing through exterior walls above grade, and underground foundation walls and other below-grade penetrations into building.

#### 1.04 RELATED WORK BY OTHERS

#### 1.05 QUALITY ASSURANCE

- A. Standards:
  - 1. Factory Mutual Global (FMG).
  - 2. Underwriters Laboratories, Inc. (UL).

## PART 2 PRODUCTS

### 2.01 STANDARD SLEEVES

- A. Material:
  - 1. Pipe sleeves:
    - a. Up to 8 in. diameter: Machine-cut Schedule 40 black steel pipe.
    - b. Bare copper piping: Copper sleeves.
    - c. Option In walls: Schedule 40 plastic pipe may be used for pipe sleeves, except where adjacent ceiling space is used for return air plenum. Refer to Drawings.
  - 2. Duct sleeves: 14 ga. steel.
- B. Sizing: Sleeves shall be large enough for insulation to be continuous, or for watertight or fire-rated sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around pipe or pipe insulation, and ductwork.

### 2.02 WATERTIGHT SLEEVE SEALS

- A. Oakum Caulking: Thiokol Corp. With lead-pour or elastomeric sealant. Elastomeric sealant shall be 2-component, polysulfide or polyurethane.
  - 1. Other Acceptable Manufacturers: Approved equal by 3M, Calpico, or Hilti.

### 2.03 FIRE-RATED SLEEVE SEALS

- A. ASTM E119 and E814 Silicone RTV foam, UL-approved.
  - 1. Acceptable Manufacturers: Dow Corning 3-654B, Chase Foam, 3M Fire Barrier caulking or putty, IPC Flamesafe, Carborundum Fibersil, Nelson Fire Stop, Johns-Manville Cerafiber, KBS Mortar Seal, Hilti Fire Stop, International Protective Coatings Corporation "Flame-Safe," or CSD Sealing Systems "FSP."

## PART 3 EXECUTION

### 3.01 COORDINATION

- A. Coordinate location of sleeves, core drilled holes, and other holes required with equipment, other Trades, and Structural Engineer.

### 3.02 CUTTING

- A. Cut off sleeves through walls flush with each surface.
- B. Cut off sleeves 1/8 in. above finished floors and 3 in. above floors in mezzanine floor. Bottom of sleeve shall be cut off flush with surface.
- C. Refer to Division 00, "Procurement and Contracting Requirements," General Conditions and Special Conditions, and Division 01, Section 01 73 29, for specific requirements regarding approved cutting methods.

### 3.03 INSTALLATION

- A. Install sleeves in walls.
- B. Piping shall not bear on sleeves. Sleeves shall be installed plumb and true to line, grade, and position.
- C. All pipe sleeves and escutcheons shall have ample clearance for pipe and covering, and shall have chrome-plated wall and floor escutcheons over the pipe in finished areas. Provide chrome-plated or prime-coated escutcheons in other rooms.

- D. Use sleeves where round duct openings are required through exposed walls, fire partitions, or equipment room walls. Close off all spaces around rectangular ducts through these walls. Close off all spaces around fans, dampers, louvers, or grilles that require rectangular openings.
- E. Install sheet metal escutcheons around ducts passing through walls exposed.
- F. Fire Blocking of Penetrations of Fire-Rated Construction:
  - 1. Use approved, UL-listed, fire-retardant sealants, backing, and packing as required to maintain fire rating of the structure penetrated.
  - 2. Spray UL-listed foam sealant around exposed piping entering and leaving fire-rated wall or floor structures.
  - 3. To ensure fire blocking, close space around ducts and pipes passing through walls and floors. Seal space up to a 1/2 in. gap with sealant or caulking. Close off space greater than a 1/2 in. gap with sheet metal and seal airtight.
  - 4. For larger openings, provide UL-listed, FMG-approved KBS sealbags as manufactured by International Protective Coatings Corporation.
  - 5. Pack all fire-rated or sound-rated separation sleeves with glass fiber, high-temperature mineral wool, aluminum-silica fiber, fire-retardant rope, calcium silicate, or other noncombustible material to maintain fire rating of structure, and finish with fire-rated sleeve seals.
  - 6. Fill space around all sleeves extending into exposed areas with material compatible with adjacent construction and finish.
  - 7. All openings shall have been UL-tested utilizing the proper rated penetrations to be equal to, or greater than, the barrier assembly in which the penetration occurs.
  - 8. All penetrations and openings shall be installed in accordance with the Manufacturers' instructions.
  - 9. The fire-blocking assembly shall maintain the required fire-resistance rating of the wall or floor in which it is placed, and a further sealant shall be applied, if necessary, to attain a smoke-tight condition. Openings without sleeves shall be closed in the same manner.
  - 10. Refer to Section 07 92 00 for additional requirements.
- G. Watertight Seals:
  - 1. Pipe sleeves penetrating outside wall or slabs on grade shall have welded intermediate flange imbedded in masonry. Space around pipe shall be clamped, packed, and caulked with lead and oakum to make an absolutely watertight seal within sleeve. Caulk around outside of sleeve.
- H. Unused sleeves shall be plugged, fire-packed, and finished to match adjacent surface.

END OF SECTION 230515





## SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

#### 1.03 DESCRIPTION

- A. Provide hangers, supports, and inserts required for piping, ductwork, flue vents, and equipment installed under the HVAC Contract.
- B. Provide all necessary inserts, expansion shields, beam clamps, pipe floor supports, and auxiliary steel.
- C. For Precast Flexicore Concrete: Provide concrete inserts, toggle bolts, etc., as required for HVAC Work.
- D. Hangers for all insulated piping shall be sized for outer diameter of insulation.
- E. Provide any additional supports, auxiliary steel, or fasteners required for attaching to structure.
- F. All hangars and supports in the washbay shall be stainless steel.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society of Mechanical Engineers (ASME).
  - 3. American Society for Testing and Materials (ASTM).
  - 4. Factory Mutual Global (FMG).
  - 5. Manufacturer's Standardization Society (MSS).
  - 6. National Fire Protection Association (NFPA).
  - 7. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
  - 8. Underwriters Laboratories, Inc. (UL).
- B. All piping supports and parts shall conform to the latest requirements of the Code for Power Piping (ANSI B31.1) and MSS Standard Practice SP-58, SP-69, and SP-89, except as supplemented or modified by the requirements of this Specification.
- C. For ductwork supports, refer to SMACNA'S "Duct Construction Standards" (Latest Edition), as applicable.
- D. Components shall be selected and matched to the load imposed on them.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Pipe Hangers, Beam Clamps, Wall Brackets: Anvil International, Inc., B-Line Systems, Inc., Carpenter & Patterson, Inc., Globe Pipe Hanger Products, Inc., Erico/Michigan Hanger Co., Inc., National Pipe Hanger Corp., PHD Manufacturing, Inc., or Klo-Shure.
- B. Channel Support Systems: B-Line Systems, Inc., GS Metals Corp., Erico/Michigan Hanger Co., Inc., National Pipe Hanger Corp., Unistrut Corp., Wesanco, Inc., or Powerstrut.

- C. Thermal Hanger Shield Inserts: Buckaroos, Inc., Carpenter & Patterson, Inc., PHS Industries, Inc., Pipe Shields, Inc., Rilco Manufacturing Co., Inc., or Value Engineered Products, Inc.

## PART 2 PRODUCTS

### 2.01 HANGERS

- A. Un-insulated Piping:
  - 1. Steel, cast iron, or plastic: 1/2 in. to 8 in.: Anvil Fig. 69. Galvanized carbon steel, adjustable swivel ring.
  - 2. Copper, 1/2 in. to 4 in.: Anvil Fig. CT-99. Copper-plated hangers, adjustable tubing ring, carbon steel ring, and malleable iron adjusting nut.
- B. Insulated Piping:
  - 1. Steel, plastic, or copper; all sizes: Anvil Fig. 260. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
  - 2. Thermal protector:
    - a. 2 in. and smaller: 12 in. long segment of rigid pipe insulation supported by Anvil Fig. 167, 18 ga. galvanized steel protection shield.
  - 3. Hanger size shall be sufficient to accommodate pipe and insulation without compressing the insulation.
  - 4. For insulated refrigerant piping use insulated couplings by Klo-Shure.
- C. Vertical Piping: Anvil Fig. 261. Friction riser clamp with 2-point bearing. Use Anvil Fig. CT-121 copper-plated riser clamp for copper pipe. Shorten legs to conceal riser clamp within pipe chase and still provide adequate support.

### 2.02 TRAPEZE HANGERS

- A. Unistrut P1000 or Superstrut A1200. Angle iron, or channel of sufficient length to support pipes and insulation on individual hangers, roller supports or saddles with insulation protectors, support capacity, support spacing, trapeze hanger rod diameter, and quantity to support total piping load.
- B. Provide individual piping attachment to each Unistrut hanger, angle, or channel.
- C. Design support system and obtain approval of a Structural Engineer licensed in Ohio. Submit details to the A/E for approval.

### 2.03 SUPPORTS

- A. Pipe hanger rods shall be solid steel, threaded ends or all-thread rods of diameter listed below, with double nut attachment to the hanger and at the hanger attachment. 3/8 in. rod diameter for pipe sizes up to 2 in.
- B. Beam Clamps (up to 8 in. diameter pipe):
  - 1. Anvil Fig. 227. Top beam clamp, steel jaw, hook rod with nut, and spring washer steel eye-bolt, with Anvil Fig. 157 for appropriate rod diameter.
  - 2. Option: Anvil Fig. 86. Malleable iron clamp, hardened steel cup point set screw with Fig. 89 steel retaining clip. **C-CLAMPS WITHOUT RETAINING CLIPS ARE EXPRESSLY PROHIBITED.**
- C. Purlin Clamps: PHD Fig. 290 Purlin Clamp. Malleable iron with jam nut, and pointed steel set screw.
- D. Wall Brackets: Carbon steel, back plates, and bolts.
  - 1. Anvil Fig. 194. Lightweight 750 lb. load.
  - 2. Anvil Fig. 195. Medium-weight 1,500 lb. load.

3. Option: Unistrut Superstrut A1200.

#### 2.04 PIPE-INSULATING SUPPORT

- A. Piping 1-1/2 in. and Smaller: Anvil Fig. 167. Provide 12 in. long, 18 ga. sheet metal half round piping shield inside clevis hanger.

#### 2.05 CONCRETE INSERTS

- A. In Pre-cast Concrete: Anvil Fig. 117. Hilti or Philips. Malleable iron, expansion case, interior standard pipe threads, external helical wedge.
- B. Refer to Manufacturer's recommendations for correct selection as to pipe size and loading.

#### 2.06 FINISH

- A. Unless otherwise noted, all steel hangers and supports shall be standard black. Exception: Hangers and supports for exposed exterior applications shall be galvanized.

#### 2.07 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A36 / ASTM A36M, steel plates, shapes, and bars, black and galvanized.

### PART 3 EXECUTION

#### 3.01 INSTALLATION — GENERAL

- A. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, loops, and bends, where used.
- B. Ceiling and ceiling grid systems shall not be used to support ductwork, electrical conduit, heating, plumbing or fire-suppression lines, or any other utility lines. Piping, ductwork, conduit, and each ceiling and ceiling grid system shall be a separate installation, and each shall be independently supported from the building structure. Where interferences occur, in order to support ductwork, flue vents, or piping, install trapeze-type hangers or supports, which shall be located where they do not interfere with access to fire dampers, valves, and other HVAC equipment items.
- C. Where the ceiling supports grilles, registers, or diffusers, install additional ceiling hangers to prevent ceiling from sagging.
- D. Where necessary, provide proper angles or channels between structural members for hanger supports. Provide additional auxiliary steel and fasteners as required to hang from purlins. Weld to steel structural members. Consult with the A/E regarding this procedure.
- E. Do not support hangers from roof deck or floor above. Span from structural members with supplementary steel where direct attachment to structural members is not practical.
- F. Avoid cutting concrete or masonry by using inserts.
- G. Use top flange beam clamps to avoid burning metal deck.
- H. The use of powder-actuated anchors or fasteners is strictly prohibited.
- I. At the Contractor's option, trapeze hangers may be used where parallel runs of pipe occur. All rods on trapeze hangers shall be 1/2 in. minimum. Clamp each pipe individually. Provide individual U-bolt clamps for insulated pipes. Clamp size to accommodate insulation and shield.
- J. Use a separate hanger for each pipe. Do not hang (1) pipe from another.
- K. Support vertical risers at the floor with friction riser pipe clamps.

- L. Whenever insulated pipe is supported by hangers, the hanger shall pass freely around the insulation.
- M. Protect the insulation where hangers contact pipe with saddles or protection shields.
- N. Install all hangers and supports with all necessary inserts, bolts, rods, nuts, washers, and other accessories, according to Manufacturer’s recommendations. Hangers shall be double-nutted.
- O. Pipe hangers shall be adjusted to proper elevation and all hanger rods shall be installed in a plumb position before pipe insulation is installed.
- P. THE USE OF C-CLAMPS WITHOUT RETAINING CLIPS IS STRICTLY PROHIBITED.
- Q. Where hanging from Z-purlins, use purlin clamps. Option: Drill vertical portion of purlin and provide angle bolted to purlin and threaded for hanger rod. Obtain approval of the and A/E for attachment method before proceeding.
- R. Metal Wall Panel Construction: Do not attach or support piping from metal panels. HANGING DIRECTLY FROM METAL PANEL WALLS IS PROHIBITED. CONTRACTOR SHALL FASTEN TO PURLIN OR GIRT.
- S. Painting:
  - 1. Touch-up: Clean field welds, bolted connections, and abraded areas of all shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same paint materials as used for shop painting. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
  - 2. Galvanized surfaces: Clean and apply galvanizing repair paint to comply with ASTM A780.

3.02 HANGER AND SUPPORT INSTALLATION

- A. Install necessary pipe hangers and supports to properly support piping and so maximum pipe deflections allowed by ASME B31.9, “Building Services Piping,” are not exceeded. Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments to properly support piping from building structure.
- B. Maximum spacing of piping supports shall be as follows:
 

PIPE SIZE	STEEL PIPE	COPPER PIPE
3/4 in. or smaller	6 ft.	5 ft.
1 in.	6 ft.	6 ft.
1-1/4 in.	6 ft.	6 ft.
1-1/2 in.	6 ft.	8 ft.
2 in.	10 ft.	8 ft.
- C. Provide additional supports as necessary to maintain piping alignment.
- D. Install wall brackets where required. Provide pipe guides and anchors to properly control pipe movement. Method shall suit job conditions. Refer to Section 23 05 10.
- E. Support piping near elbows, such that the total cantilevered length for both sides of the elbow does not exceed 3 ft.
- F. Install hangers and supports to provide slope where indicated.

3.03 DUCTWORK AND FLUE VENT HANGER INSTALLATION

- A. Install necessary hanger rods and angle iron support brackets to properly support ductwork, flue vent, insulation, reinforcing, and external loads. Maximum spacing of supports shall be as follows:

RECTANGULAR DUCTS		
1/2 X DUCT PERIMETER	ROD DIAMETER	SPACING
Less than 72 in.	1/4 in.	10 ft.
72 in. to 120 in.	3/8 in.	8 ft.

ROUND DUCTS		
DUCT DIAMETER	ROD DIAMETER	SPACING
Up through 26 in.	1/4 in.	12 ft.

- B. Use a pair of rods, (1) on each side of ductwork. Rods shall be uncoated hot-rolled steel.
- C. Use sheet metal screws to attach hanger bracket to ductwork.
- D. Option: 1 in. wide sheet metal straps may be used as per the latest SMACNA HVAC Duct Construction Standard.

END OF SECTION 230529



SECTION 230553.02 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Identify by labels and tags the following items:
  1. Equipment such as fans, fan coil units, condensing units, control cabinets, and similar items.
  2. Piping exposed in equipment rooms, accessible service areas, or accessible chases.
  3. Piping running above accessible ceiling construction.
  4. Exposed ductwork and ductwork in equipment rooms and running above accessible ceiling construction.
- B. Install laminated plastic nameplates for equipment, and stencils for piping and ductwork.
- C. Install piping identification at MAXIMUM 25 FT. intervals.

1.03 QUALITY ASSURANCE

- A. Standards:
  1. American Society of Mechanical Engineers (ASME) A13.1.
  2. Occupational Safety and Health Administration (OSHA).

1.04 ACCEPTABLE MANUFACTURERS

- A. Seton "Setmark" or approved equal by Brady, MSI, or Calpico.

PART 2 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION

- A. Engraved laminated plastic nameplates, sized for 3/4 in. high letters or numbers, Gothic style.

2.02 PIPING AND DUCTWORK IDENTIFICATION

- A. Stencils. Letter size shall be as follows:

OVERALL PIPE/INSULATION SIZE	MINIMUM LETTER HEIGHT
Up to 1-1/4 in. diameter	1/2 in. high
1-1/2 in. to 2 in. diameter	3/4 in. high

2.03 IDENTIFICATION SCHEDULE

- A. Identify as follows:

Type of Service	PIPING		Designation
	Background Color	Letter Color	
Refrigerant Liquid	Yellow	Black	L
Refrigerant Suction	Yellow	Black	S
Air Conditioner Condensate	Green	White	COND



DUCTWORK

Type of Service	Background Color	Letter Color	Designation
Low Pressure Supply Air	Green	White	SUPPLY
Low Pressure Return Air	Green	White	RETURN
Low Pressure Outside Air	Green	White	O.A.
Exhaust Air	Blue	White	EXH.

PART 3 EXECUTION

3.01 COORDINATION

- A. Coordinate to ensure that the identification used by all Trades is uniform in type, style, and appearance.
- B. Coordinate the exact nomenclature to be used on equipment nameplates with the Owner and A/E.

3.02 INSTALLATION

- A. Equipment tags and nameplates shall be attached with stainless steel screws. Exception: Use compatible adhesive where screws might damage equipment or ductwork.
- B. Apply piping identification only after any finish painting is completed. Provide service and flow arrow designations at MAXIMUM 25 FT. intervals.
- C. Also identify piping at connections to equipment, at valves, at branches from main, at each riser, and at both sides of wall or partition through which pipe passes.
- D. Where pipes pass through a wall or partition, apply a service label on the pipe where it enters and exits the wall.
- E. Ductwork in mechanical spaces shall be labeled with service and flow arrows at MAXIMUM 25 FT. intervals.
- F. Apply stencil over background, in colors as indicated above, and varnish over when dry. Stencils shall be readable from a standing position.

END OF SECTION 230553.02

## SECTION 230560 - REQUIREMENTS FOR COMPLETION OF HVAC WORK

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 01 33 00, "Submittal Procedures."
- B. Section 09 91 23, "Painting and Coating."
- C. Section 23 05 00, "Common Work Results for HVAC."
- D. Section 23 05 06, "HVAC Submittals."
- E. Section 23 05 07, "HVAC Operating and Maintenance Data."
- F. Section 23 05 53.02, "Identification for HVAC Piping and Equipment."
- G. Section 23 05 93.01, "Testing, Adjusting, and Balancing for HVAC."

#### 1.03 DESCRIPTION

- A. Complete and submit the following list, which is a partial list of the items required prior to Contract Completion:
  - 1. Submittals. Refer to Section 23 05 06.
  - 2. Operational tests of all equipment and systems as required in this, as well as other, Sections. Refer to Section 23 05 00.
  - 3. Protection and cleaning. Refer to Section 23 05 00.
  - 4. Operating and Maintenance Manuals. Refer to Section 23 05 07.
  - 5. Record Drawings. Refer to Section 23 05 00.
  - 6. Painting. Refer to Section 23 05 00.
  - 7. Guarantee. Refer to Section 23 05 00.
  - 8. Equipment, piping, and ductwork identification. Refer to Section 23 05 53.02.
  - 9. HVAC systems balancing. Refer to Section 23 05 93.01.
  - 10. Instruction of the Owner's personnel as required in this, as well as other, Sections.
  - 11. Spare parts as required in this, as well as other, Sections.
  - 12. Equipment warranties.
- B. Provide or perform all of the above items before Contract Completion.

### PART 2 PRODUCTS

#### 2.01 SPARE PARTS

- A. Provide a receipt, signed by the Owner, for all spare parts and insert it in the Operating and Maintenance Manuals. Furnish (1) complete set of the following spare parts for the Owner's use after the guarantee period expires:
  - 1. Special keys, wrenches, and similar items required, or special tools.
  - 2. Install a set of filters in each unit for use during construction. Install a new set of filters in each unit at Contract Completion. Furnish a third set of filters for each unit to the Owner at Contract Completion.

3. Spare set of belts for each fan.
4. Any other parts mentioned elsewhere.

### PART 3 EXECUTION

#### 3.01 FINAL OPERATING TESTS AND PROCEDURES

- A. Prior to Contract completion, conduct system operational tests for a period of at least (5) days, not necessarily consecutive, as scheduled by the Owner, to demonstrate fulfillment of the requirements of the Contract. During this time, adjust equipment so that it will perform as the Manufacturer intended, and so that systems will function as designed.
- B. Each system shall be operated in every mode of operation, and the position of valves, dampers, switches, and other devices shall be checked for proper closure, operation, and switching.

#### 3.02 INSTRUCTION OF OWNER'S PERSONNEL

- A. Each Contractor, or major Subcontractor or Tradesman, shall provide a minimum of (4) hours of in-service training for the system's operators. Provide all applicable user manuals and related training documentation.
- B. Provide training schedule and training outline for approval (45) days prior to Contract Completion.
- C. After all system operational tests have been completed, schedule an instruction period with the Owner. Schedule well in advance, so that all of the Owner's personnel may attend if they desire. Coordinate with the Owner and A/E for date and time of training sessions.
- D. Participate in training sessions. Instruct the Owner's personnel in the operation and maintenance of all systems and equipment. Use Operating and Maintenance Manuals to familiarize the Owner's personnel with equipment and procedures. Allow time as necessary for this instruction. Videotape all Owner training, instructions, and equipment start-up demonstrations. Turn over a copy of the videotape to the Owner. Instruction shall include the following:
  1. Location of equipment and explanation of what it does (function).
  2. Reference to operating instruction manuals for record and clarity.
  3. Coordination of written and verbal instructions, so that the operation of each system is fully understood by operating personnel.
  4. Complete review of items contained in Operating and Maintenance Manuals.
  5. Discussion of maintenance procedures that must be followed by the Owner.
  6. Complete demonstration and explanation of each Special System.
  7. Performance of specific and random flow tests by the Air Balance Subcontractor. Refer to Section 23 05 93.01.
  8. Complete explanation of temperature control system.
- E. Obtain a signed and dated letter from the Owner, stating satisfactory completion of instruction, listing names of personnel instructed, and listing names of persons giving the instruction. Submit a copy to the A/E. Insert copies in each Operating and Maintenance Manual.
- F. Provide a copy of SAO Form No. 34, "Certificate of Equipment Demonstration," signed by the Owner.

#### 3.03 FOLLOW-UP INSPECTIONS

- A. Make an inspection within (90) days after occupancy of the building to make minor adjustments as needed to ensure that all equipment is operating properly. Schedule with the A/E.

- B. Make an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made and make any modifications to the initial adjustments of equipment to produce the proper operation.
- C. A minimum of (1) month before the end of the guarantee period, contact the Owner and A/E to discuss system operation, and to plan for the future care and maintenance of the system.
- D. (1) month before the end of the guarantee period, contact the Owner and perform an inspection to review any items needing correction.
- E. Complete the punch-list and send back a copy to the A/E, with each item initialed, when completed. Refer to Article 10 of the General Conditions.

END OF SECTION 230560



SECTION 230593.01 - TESTING, ADJUSTING AND BALANCING FOR HVAC (AIR ONLY)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Provide all labor, materials, and tools for completely testing, balancing, and adjusting the following systems:
  - 1. Air flows.
  - 2. Air temperature difference on all coils and heat exchangers.

1.03 QUALITY ASSURANCE

- A. Standards: Associated Air Balance Council (AABC) National Standards for Field Measurement and Instrumentation.
- B. Instruments used for testing and balancing of air systems must have been calibrated within a period of (6) months and checked for accuracy prior to start of work on this Project.

1.04 TEST AND BALANCE SUBCONTRACTOR QUALIFICATIONS

- A. Retain the services of an Independent Test and Balance Agency that specializes in, and whose business is limited to, the testing and balancing of HVAC systems. The Agency selected shall be fully certified by the AABC and shall have at least (1) member certified by the National Examining Board of the United States and Canada. Certification by the National Environmental Balancing Bureau (NEBB) will also be acceptable.

1.05 ON-GOING INSPECTIONS

- A. Inspect the installation of all HVAC systems, including equipment, sheet metal work, temperature controls, and other components. This inspection work shall be performed periodically as the HVAC Work progresses.
- B. Make an inspection within (90) days after occupancy of the building to ensure that satisfactory conditions are being maintained throughout, and to satisfy any unusual conditions.
- C. Make an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made and make any modifications to the initial adjustments to produce the proper conditions in each conditioned space.
- D. The various air systems shall be in operation with all accessories, filters, and diffusers in place.
- E. Inspect air leakage in ducts, and report any excessive leakage to the A/E.
- F. Inspect system and determine if there are any adverse air flows (positive or negative) in the building.

1.06 AIR SYSTEMS

- A. Air velocities shall be measured with an anemometer, velometer or pitot tube, and manometer. Static pressures and total pressures shall be measured with a velometer or pitot tube, and manometer. Fan RPM shall be measured with a tachometer or revolution counter. Motor amperage

shall be measured with an “Amprobe” or similar device. Voltages shall be measured with a voltmeter.

- B. In measuring velocities in ducts or at outlets, traverse the duct or outlet so that (1) reading is taken for each 80 sq. in. maximum of flow area. A minimum of (6) readings shall be taken for each duct or outlet regardless of size.
- C. Adjust supply air systems as follows:
  - 1. Adjust all fans to deliver the design air quantities at system design static pressure.
  - 2. Adjust all duct-balancing dampers and extractors for initial balance.
  - 3. Adjust dampers at individual diffusers and registers for the design air quantities.
  - 4. Adjust dampers and register or grille bars to provide uniform draftless air distribution in all areas of rooms.
  - 5. Readjust duct-balancing dampers if diffuser dampers are noisy.
  - 6. Any or all of the above procedures shall be repeated until air quantities at individual registers or diffusers are within 5% of quantities shown on the Drawings, and total air quantity handled by each system is within 5% of the quantity shown or specified.
- D. Air balance report shall include the following data and information:
  - 1. Average of final velocity readings taken at each supply air outlet or exhaust register, size of outlet, free area of outlet, and air quantity delivered or exhausted.
  - 2. Average of final velocity readings taken at each fan or air handling unit, size of the duct or plenum, and total air quantity delivered or exhausted by the fan or unit.
  - 3. Final static pressure at each fan outlet and at each fan inlet. Measure static pressure across fan only, not across the entire unit.
  - 4. Final fan speed for each fan.
  - 5. Manufacturer’s fan curve for each fan or air handling unit, with balance position plotted.
  - 6. For each motor: Final running amperage, actual voltage, motor horsepower and nameplate amperage, and starter element sizes and amperage ratings. If starter elements amperage rating is not more than 10% greater than motor nameplate amperage, provide proper size elements.
  - 7. Air temperature rise or drop across all coils and heat exchangers.
  - 8. Entering and leaving dry bulb and wet bulb temperatures on all cooling coils. Check readings after compressors have run sufficiently to obtain full capacity.

#### 1.07 FAN SHEAVES

- A. Where necessary, or when directed by the A/E, provide larger or smaller fan pulleys at no additional cost to the Owner, sized to drive the fans at the speeds necessary to give the indicated air flow.

#### 1.08 QUALITY CONTROL

- A. Testing and balancing shall be performed in complete accordance with AABC National Standards for Field Measurement and Instrumentation, Form #81266, Volume 1, sections as applicable.
- B. At the final inspection, the Test and Balance Subcontractor shall recheck, in the presence of the Owner’s personnel, specific and random selections of data recorded in the Certified Report. If random tests indicate a measured flow deviation 5% greater than that recorded in the Certified Report, the report shall be automatically rejected. In the event the report is rejected, the Test and Balance Subcontractor shall readjust and test the system, submit new reports, and reinspect at no cost to the Owner.
- C. Following acceptance of the Certified Report by the Owner, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked by the Test and Balance

Subcontractor, so that adjustment can be reestablished if disturbed. Devices shall not be marked until after final acceptance.

END OF SECTION 230593.01





## SECTION 230700 - HVAC INSULATION

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Refer to Section 23 05 29, "Hangers and Supports for HVAC Piping and Equipment," for pipe-insulating supports.
- B. Section 23 31 13.01, "Metal Ducts (Low-Velocity)."

#### 1.03 DESCRIPTION

- A. Insulate the following items:
  - 1. Piping:
    - a. Indoor air conditioning condensation drain.
    - b. Refrigerant suction.
  - 2. Round ductwork:
    - a. Above-ceiling supply.
    - b. Exposed supply.
    - c. Return.
    - d. Outside air.
  - 3. Rectangular ductwork:
    - a. Above-ceiling supply.
    - b. Exposed supply.
    - c. Return.
    - d. Outside air.
- B. Insulation is not required on exhaust ducts.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American Society for Testing and Materials (ASTM) E-84.
  - 2. National Fire Protection Association (NFPA).
  - 3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
  - 4. Underwriters Laboratories, Inc. (UL).
- B. Insulation shall be in accordance with the State Energy Code.
  - 1. Piping insulation shall provide a maximum allowable heat loss of 25 BTUH per sq. ft. of pipe surface area.
- C. Installation shall be done by Tradesmen specializing in insulation work in strict accordance with Manufacturer's recommendations.

#### 1.05 FIRE AND SMOKE HAZARD RATINGS

- A. Insulation and related components, such as coverings, coatings, tapes, and cloths, shall not exceed 25 Flame Spread, 50 Smoke Developed, and 50 Fuel Contributed on above-ground insulation, according to ASTM E-84 test and NFPA 255.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Leave insulation boxed and stored until time for use. Elevate and cover material to avoid moisture condensation and physical abuse.

1.07 ACCEPTABLE MANUFACTURERS

- A. Owens Corning Fiberglas or approved equal by Schuller, Certainteed, Armstrong, Rubatex, Imcoa, Manson, or Knauf.
- B. Manufacturer and Model Number listed under Part 2 shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

PART 2 PRODUCTS

2.01 INSULATION

- A. Foam: Shall only be used for air conditioning condensation drain piping and refrigerant suction piping. Obtain approval from the Code Authority having Jurisdiction for use of this insulation type.
  - 1. Closed cell, foamed plastic, tubular, 1/2 in. minimum wall thickness, fire-rated, 220 deg. F. temperature rating. Pipe and joints shall be sealed with Manufacturer's approved adhesive.
  - 2. Acceptable Manufacturers: Armstrong fire-rated "Armaflex," Rubatex, or Imcoa.
- B. HVAC Ductwork:
  - 1. Concealed rectangular and round ducts: Owens Corning All Service Wrap. 1-1/2 in. thick, 1 lb. density flexible fiberglass blanket, with reinforced foil and kraft vapor barrier facing, 250 deg. F. temperature rating.
  - 2. Exposed round ducts: Flexible, 1 in. thick, 6 lb. density, fiberglass board with "AP" vapor barrier facing, 250 deg. F. temperature rating.
  - 3. Exposed rectangular ducts: Owens Corning 703 ASJ. Semi-rigid, 1-1/2 in. thick, 3 lb. density, fiberglass board with ASJ vapor barrier facing, 250 deg. F. temperature rating.
  - 4. Outside air intake ducts: 2 in. thick, 3 lb. density, fiberglass, with reinforced foil and kraft vapor barrier facing, 250 deg. F. temperature rating.

PART 3 EXECUTION

3.01 PIPING INSULATION

- A. Do not use damaged or water-soaked insulation.
- B. Insulate any pipe hanger or pipe support that has direct contact with any cold piping, or any item that is subject to sweating.
- C. Insulation shall be continuous through sleeves and hangers and through walls where no sleeves are required.
- D. Piping shall be pressure-tested and accepted before piping insulation is installed.
- E. All hangers shall be set perpendicular before any insulation is applied.
- F. Complete installation of insulation and sealing shall be in strict accordance with Manufacturer's recommendations.
- G. All damaged insulation shall be replaced at the Contractor's expense.
- H. Maintain continuity of all insulation. No voids in insulation or vapor barriers shall be permitted.

3.02 DUCTWORK INSULATION

- A. Leave no "raw" ends on any insulation. Seal joints with 2 in. wide application of adhesive.
- B. Use adhesive and welded pins with washers for attaching rigid board insulation to ductwork. Seal joints with a 2 in. wide application of adhesive.
- C. All duct sizes shown are INSIDE CLEAR DIMENSIONS.
- D. Tape and seal all exterior joints.
- E. Install insulation so as not to interfere with the operation of sprinklers.

3.03 PIPING INSULATION THICKNESSES

- A. Condensation Drain Piping:
  - 1. Piping:
    - a. 1 in. and smaller: 1/2 in. thick, minimum.
    - b. 1-1/4 in. and larger: 3/4 in. thick, minimum.
- B. Refrigerant Suction Line: 3/4 in. minimum.

3.04 CONCEALED DUCTWORK INSULATION

- A. Duct Wrap Installation: Use 3 in. wide pressure-sensitive tape on all joints, screws, exposed pins, terminations, and breaks.

3.05 EXPOSED DUCTWORK INSULATION

- A. Install insulation on the outside on stick clips, or welded pins.
- B. Duct Wrap Installation: Install 3 in. wide pressure-sensitive tape on all joints, screws, exposed pins, terminations and breaks.

END OF SECTION 230700



SECTION 230933 - ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Provide a complete operating control system for all heating, ventilating, and air conditioning systems.
- B. Contractor shall coordinate all controls and wiring thereof, regardless of who furnishes the item. Contractor is responsible for all wiring diagrams, and writing all Sequences of Operation.

1.03 QUALITY ASSURANCE

- A. Standard: National Fire Protection Association, NFPA 90-A, Chapter 10.
- B. Contractor/Manufacturer Qualifications:
  - 1. The Installer shall be an authorized representative of the Control System Manufacturer and shall have a minimum of (5) years experience in installing automation/temperature controls systems.
  - 2. All products used shall be new, standard, off-the-shelf products. Spare parts shall be available for at least (5) years after contract completion.

1.04 SEQUENCES OF OPERATION

- A. No revisions will be permitted which change the described operation or end results.

1.05 SUBMITTALS

- A. Furnish shop drawings showing all control schemes, with written description of sequences, and terminal-to-terminal wiring diagrams. Number all terminals.

1.06 ACCEPTABLE MANUFACTURERS

- A. Bryant or equal by Honeywell, Johnson Controls, Carrier, Trane, or Lennox.

1.07 CONTROL WIRING

- A. *Contractor shall be responsible for all wiring.*

1.08 DIAGRAM

- A. Place a copy of Temperature Control Schematic Diagram and Sequence of Operation for a given piece of equipment, in a plastic binder, and hang it on the wall inside the equipment room housing that piece of equipment.

1.09 WARRANTY

- A. Labor and materials for the control system specified shall be warranted free from defects for a period of (12) months after contract completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner. Contractor shall respond to the Owner's request for warranty service within (24) hours during normal business hours.

- B. All work shall have a single warranty date, even when the Owner has received beneficial use due to an early system start-up.
- C. At the end of the final start-up, testing, and commissioning phase, the A/E shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this Specification. The date of contract completion shall be the start of the warranty.

## PART 2 PRODUCTS

### 2.01 MISCELLANEOUS PRODUCTS

- A. Heating/Cooling Thermostats:
  - 1. Fan coil units: Thermostats furnished with equipment by Manufacturer.
  - 2. Radiant heaters: Thermostats furnished with equipment by Manufacturer.
  - 3. Thermostats shall be wall-mounted, programmable, unless noted otherwise.

## PART 3 EXECUTION

### 3.01 COORDINATION

- A. Coordinate exact locations of thermostats with the A/E before roughing in.

### 3.02 INSTALLATION

- A. Mount room thermostats at 4 ft.-0 in. above floor, exactly level with any adjacent light switches.
- B. Coordinate exact locations of thermostats with the A/E before roughing in.

### 3.03 CHECKOUT

- A. Check the function of each item. Ensure each item starts and functions properly.

### 3.04 ADJUSTMENT

- A. Calibrate all controls.
- B. Return and make *adjustments during guarantee period, at no charge.*

### 3.05 WIRING INSTALLATION

- A. All control and interlock wiring shall comply with 2008 National Electrical Code (NEC), local electrical codes, and Division 26 of this Specification. Wiring shall be installed in conduit. Conduit shall be minimum 1/2 in. galvanized EMT.
- B. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)
- C. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- D. Maximum allowable voltage for control wiring shall be 120 volts.

### 3.06 SEQUENCES OF OPERATION

Contractor shall provide all equipment and wiring as necessary to accomplish the following sequences of operation:

- A. Heat Pump:

Fan Key	Effect
ON	Fan runs continuously.

AUTO Wall thermostat cycles fan and heating or cooling as required to maintain space temperature.  
CIRC Fan runs randomly approximately 35% of the time for improved circulation

System Key

HEAT Wall thermostat cycles heat pump to heat, to maintain space temperature. Cooling will be locked out.

OFF Both heating and cooling systems are off

COOL Wall thermostat cycles heat pump unit to cool, to maintain space temperature. Heating will be locked out.

AUTO Controls both heating and cooling systems automatically based on space temperature  
Thermostat controls emergency heat and auxiliary heat (gas) if needed. Heat pump is locked out.

- B. Exhaust fans EF-1 (HOA switch) and EF-2 (HOA switch) shall become energized by the gas detection system.
- C. Radiant Heating Units: See Section 23 83 00.01.
- D. Electric Heating Units: See Section 23 83 42.
- E. Exhaust Fans:
  - 1. Some exhaust fans are controlled manually from starters or wall switches. Provide starters and switches. Refer to Electrical Drawings. EF-1 and EF-2 shall have HOA switches in accessible locations. Auto shall run with gas detection system. Dampers for L-3 and L-4 shall open when EF-1 and EF-2 operate.
  - 2. Exhaust fans EF-1, and EF-2 are controlled by carbon monoxide / nitrogen dioxide detectors.
  - 3. Wash bay fan EF-3 shall be controlled by a wall mounted switch. Label switch with corresponding exhaust fan. Damper for L-5 will open when EF-3 operates.
  - 4. Exhaust fan EF-4 shall operate with the room's associated lighting switch.
  - 5. Exhaust fan EF-5 is to be controlled by a thermostat for cooling in mechanical area. Refer to HVAC Drawings and Exhaust Fan Schedule.
  - 6. Some exhaust fans have motorized backdraft dampers. Refer to Exhaust Fan Schedule.
  - 7. Provide all necessary 120 volt damper motors and linkage for motorized dampers.
- F. Motor-Operated Dampers: Dampers open when associated fan or heat pump is running.

END OF SECTION 230933





## SECTION 232115 - CONDENSATION DRAIN PIPING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 07 00, "HVAC Insulation."

#### 1.03 DESCRIPTION

- A. Provide piping for the following:
  - 1. Condensation drain from each cooling coil.

### PART 2 PRODUCTS

#### 2.01 PIPING

- A. Type "L" hard copper tubing (ASTM B88).
- B. Insulation: Refer to Section 23 07 00.

#### 2.02 FITTINGS

- A. Wrought copper or wrought bronze solder fittings (ASME B16.11).
- B. Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or B16.22. O-rings for copper press fittings shall be of EPDM construction.

#### 2.03 SOLDER

- A. 95/5 Tin-Antimony.

### PART 3 EXECUTION

#### 3.01 INSTALLATION OF CONDENSATION DRAIN PIPING

- A. Provide condensation drain piping from outlets on drain pans of cooling coils, separate from combustion chamber drains, and other air handling unit sections indicated. Run independently to floor drain, or as shown on the Drawings.
- B. All cooling coil condensation drain lines shall be trapped at unit. Install removable insect screen at termination, if taken outside. Refer to Manufacturer's instructions.
- C. Height of water in condensate traps shall be equal to static pressure available at the drain pan plus a minimum of 2 in. Refer to Detail.
- D. Pitch all condensation lines down a minimum of 1 in. in 30 ft. in the direction of flow.
- E. Provide cleanouts consisting of plugged tees at all changes of direction, including at traps.
- F. Install copper press fittings in accordance with Manufacturer's written instructions using Manufacturer's approved tools.

END OF SECTION 232115



## SECTION 232300 - REFRIGERANT PIPING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 07 00, "HVAC Insulation."

#### 1.03 SCOPE

- A. Provide refrigerant piping between the indoor evaporator units and outdoor condensing units. Install oil and refrigerant charge, and test system.
- B. Size refrigerant piping according to Manufacturer's recommendations.

### PART 2 PRODUCTS

#### 2.01 REFRIGERANT PIPING

- A. Hard drawn, Type "ACR" copper tubing (ASTM B88), cleaned, and capped. Option: Pre-charged, pre-insulated line set.
- B. Insulation: Refer to Section 23 07 00.

#### 2.02 FITTINGS

- A. Wrought copper or wrought bronze fittings, (ANSI B16.22) with joints brazed.

#### 2.03 BRAZING ALLOYS

- A. 45% silver/phosphorous or silver/zinc alloys with a melting point greater than 1,000 deg. F.
- B. Acceptable Manufacturers: Sil-Fos by Handy Harmon, Aircosil by Airco Welding Products, or ESAB Allstate.

#### 2.04 SERVICE VALVES

- A. Henry Type 203.

#### 2.05 FLEXIBLE CONNECTORS

- A. Corrugated stainless inner tube with braided outer shield, 500 lb. maximum working pressure, sweat connections.
- B. Acceptable Manufacturers: Metraflex, Flexonics, Flexicraft, or Hyspan Precision Products.

#### 2.06 ACCESSORIES

- A. Liquid line dryer, expansion valve, sight glass, charging valves, if not packaged with units.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Clean ends immediately before brazing joints. Maintain a continual flow of inert gas (nitrogen) through the tubing while brazing joints. Plug ends to exclude dirt and foreign matter during construction.
- B. Adequately support tubing with consideration for expansion, contraction, and vibration.
- C. Install refrigerant piping and refrigerant specialties according to recommendations of Manufacturer of evaporator coils and condensing units.

#### 3.02 PIPING VIBRATION CONTROL

- A. Install flexible connectors in piping connections to air-cooled condensing unit.

#### 3.03 LEAK TESTING

- A. After refrigerant piping system is completed, but before insulation is applied, the system shall be thoroughly tested for leaks. Inert gas at 450 PSIG may be used for initial test.
- B. After system is tight, all inert gas shall be evacuated. During evacuation, all Schrader valves shall be capped, rate not to exceed 2 in. Hg. per second; perform triple evacuation procedure in accordance with trade standard, leave 20 PSIG minimum static charge of nitrogen in refrigeration system for layover period, until properly charged. Furnish and place full refrigerant charge in the system for proper operation. System shall be leak-tested with halide leak detector after installation of refrigerant. All defective materials shall be replaced. Leaking joints shall be completely re-done, and the entire testing procedure performed again.
- C. No test shall be performed when outside air temperature is below 65 deg. F.
- D. Test shall be witnessed by the A/E. Schedule well in advance with the Owner.
- E. All testing shall be performed in strict accordance with the Equipment Manufacturer's guidelines, and shall be witnessed by the Manufacturer's Representative.

END OF SECTION 232300

## SECTION 233113.01 - METAL DUCTS (LOW-VELOCITY)

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 05 12, "HVAC Vibration Isolators."
- B. Section 23 05 15, "HVAC Sleeves."
- C. Section 23 05 29, "Hangers and Supports for HVAC Piping and Equipment."
- D. Section 23 07 00, "HVAC Insulation."
- E. Section 23 33 13, "Dampers."
- F. Section 23 37 13, "Diffusers, Registers, and Grilles."

#### 1.03 DESCRIPTION

- A. Provide ductwork, including turning vanes, extractors, splitter-dampers, volume dampers, access doors, and flex connections, for the following:
  - 1. Outside air.
  - 2. Supply air.
  - 3. Return air.
  - 4. Exhaust air:
    - a. Toilet rooms.
    - b. Janitor's rooms.
    - c. Kitchenettes.
    - d. Compressor area.
    - e. Garage.
    - f. Wash Bay.
- B. Ductwork layout is schematic; provide risers, drops, offsets around obstructions, flattened sections, etc., and all fittings as necessary to install the ductwork.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
  - 2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA), including SMACNA Publication, "HVAC Duct Construction Standards — Metal & Flexible," 2nd Ed., 1995. These are absolute MINIMUM STANDARDS; some requirements listed herein may be greater than these; duct construction shall meet or exceed the more stringent standards.
  - 3. National Fire Protection Association (NFPA) latest edition.
  - 4. Underwriters Laboratories, Inc. (UL).

#### 1.05 SUBMITTALS

- A. If any changes are made from the duct layout shown, submit ductwork layout shop drawings to the A/E for review. Coordinate size and location of ductwork and insulation with structure, piping, lighting, equipment, conduit, bus ducts, cable trays, ceiling construction and clear height above, and

other items that may present a potential conflict. Note that the dimensions indicated are NET INSIDE CLEAR DIMENSIONS.

- B. Layout drawings shall be at 1/8 in. = 1 ft.-0 in. scale, (or larger, if Contract Drawings are larger,) with enlarged sections and elevations as necessary.
- C. Contractor shall use these drawings as a basic coordination tool.
- D. During the bidding period, notify the A/E of any conflicts observed between the ductwork and the work of any other Trade.
- E. Refer to General Conditions for additional requirements.

#### 1.06 DUCT DIMENSIONS

- A. The dimensions indicated on the Drawings are the NET INSIDE CLEAR DIMENSIONS available for air flow.
- B. Allow for exterior insulation thickness.

### PART 2 PRODUCTS

#### 2.01 STEEL DUCTWORK

- A. SMACNA Section I. Galvanized steel, 24 ga. through 16 ga., intermediate reinforcing bracing, slip joints, mechanical formed seams, beaded, and cross-broken.
- B. Elbows, Branches, Transitions, Offsets: SMACNA Section II. Round duct fittings shall be conical with scoops at branch takeoffs. Round elbows shall be 3-piece type.
- C. Turning Vanes: Tuttle & Bailey "Duct-Turns." SMACNA Section II, Fig. 2-3. Double-thickness airfoil.
  - 1. Other Acceptable Manufacturers: Approved equal by Titus or Anemostat.
- D. Equipment Casings, Flexible Connections, Curbs, Plenum Access Doors: SMACNA Section VI.
- E. Hangers, Attachments, and Supports: SMACNA Section IV.

#### 2.02 ALUMINUM DUCTWORK (WASH BAY EXHAUST)

- A. SMACNA Section I, pages 1-32. Lock-forming grade of sheet material, Aluminum Alloy 3003-H-14, 0.025 in. through 0.080 in. thickness with reinforcing and construction as required for steel ductwork.
- B. Fittings, turning vanes, and hangers shall be aluminum and similar to that used for steel ductwork.
- C. Use increased sizes of support members to compensate for smaller yield strength of aluminum stock.

#### 2.03 PLENUMS AND MIXING BOXES

- A. SMACNA Section VI, Galvanized steel. Insulated galvanized steel access doors with Ventlock #206 latches and Ventlock #264 hinges.

#### 2.04 FLEXIBLE DUCTWORK AND FLEXIBLE DUCT CONNECTIONS

- A. Flexible Ductwork:
  - 1. Contractor-fabricated insulated round rigid sheet metal ductwork for branch runouts with insulated flexible duct connections to diffusers (maximum 5 ft. long flexible duct).

2. Option to insulated rigid round ductwork: Flexmaster Type TL-V. Pre-insulated, semi-rigid, triple-lock, aluminum, flexible, round ductwork for branch runouts and connections to diffusers. 6 in. pressure rating.
3. Flexible duct connections to diffusers (maximum 5 ft. long): Flexmaster Type 3M. Insulated with a trilaminate of aluminum foil, fiberglass, and aluminized polyester. Fire-retardant-reinforced aluminum outer jacket. 12 in. positive pressure rating.
4. UL 181 Class I, shall not exceed 25 Flame Spread and 50 Smoke Developed.

B. Flexible Duct Connections: Ventfabrics "Ventglas." 30 oz. neoprene-coated glass fabric.

#### 2.05 DUCT SEALER

A. Acceptable Manufacturers: United McGill Corporation "United Duct Sealer" or approved equal by Hardcast or Foster.

#### 2.06 DAMPERS

A. Refer to Section 23 33 13 for extractors, splitter-dampers, volume dampers, backdraft dampers, and motorized control dampers.

#### 2.07 DUCT ACCESS DOORS

A. Ward Industries. Constructed of corresponding metal, minimum 22 ga. with felt stripping or foam rubber gasketing, and completely airtight. Provide QUICK-OPENING LATCHES OR WING NUTS.

1. Rectangular door equal to width of duct minus 1 in. in one direction, and at least 12 in. in the other direction for access to motorized, or fire dampers. Larger size, if noted.

#### 2.08 FINISHING

A. Exposed round or rectangular ductwork in finished spaces shall be coated with Glidden #5229 galvanized primer or provided with "paint grip" primed by the Contractor for field painting. Provide (primed) sheet metal escutcheons wherever ductwork penetrates a finished wall surface.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Ductwork installation shall comply with all recommendations of applicable SMACNA Section.
- B. Install turning vanes at all changes of direction in rectangular ducts. Option: Use standard radius turns, with centerline radius a minimum 1-1/2 times duct dimension.
- C. Install extractors at all rectangular supply branches. Install combination scoop extractors/butterfly dampers at all round supply branches to diffusers. (Option: Install 45 deg. or 90 deg. side take-off at all round supply branches.) Ensure damper quadrant operator is exposed after insulating ductwork. Tape around operator to maintain vapor barrier.
- D. Apply sealer to all joints according to SMACNA Standards.
- E. Make final connections to diffusers in suspended ceilings with insulated flexible duct (5 ft. long maximum).
- F. Install a minimum 4 in. flexible connection where ductwork connects to motor-driven equipment. Do not bulge or install on a bind.
- G. Install duct access doors in accessible, usable locations.
- H. Install duct access doors on each side, at each fire damper, and at each motorized damper.



- I. Install duct access doors in return air ducts at 20 ft. intervals.
- J. Keep ductwork as tight as possible to underside of structure or floor or roof above. Maintain at least 7 in. clear between duct or duct insulation and suspended acoustical tile ceiling, where recessed light fixtures occur. Option: Route duct to clear light fixtures. Maintain additional clearance where recessed can lights occur. Otherwise, provide 3 in. minimum clearance above bottom of ceiling.
- K. All ducts shall be rigidly braced.
- L. Install all dampers and provide blank-off plates to seal frames airtight.
- M. Install sheet metal escutcheon around ducts passing through walls exposed.
- N. All return or exhaust air ductwork connections to registers or grilles shall be made with proper transitions. Refer to details on Drawings. Abrupt connections or contractions, such as rectangular to round in the direction of air flow, or large to small duct, are prohibited. All duct transitions shall be smooth and symmetrical, with a maximum 15 deg. pitch to each side of the transition.
- O. Seal all outside air, exhaust air, and relief air sheet metal plenums, where snow could blow in, melt, and cause moisture damage to ceilings, walls, etc.
- P. Paint flat black the inside of all ductwork behind grilles and registers that will be exposed to view in occupied areas.
- Q. Any risers or drops shall be made with 3-piece or 5-piece elbows per SMACNA.

### 3.02 TESTING

- A. Pressurize ductwork to 110% of design pressure. Air leakage shall not exceed 0.5% of the design cubic feet per minute in any main or branch. The A/E shall witness test. Schedule a minimum of (48) hours in advance.

END OF SECTION 233113.01

## SECTION 233313 - DAMPERS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 09 33, "Electric and Electronic Control System for HVAC."

#### 1.03 DESCRIPTION

- A. Provide all fixed dampers for adjusting air flow.
- B. Install motor-operable control dampers furnished by the Temperature Controls Subcontractor. Temperature Controls Subcontractor shall provide low-voltage transformers as necessary.
- C. Provide gravity backdraft dampers where indicated.
- D. Motor operable dampers for exhaust fans shall be furnished with the units.

#### 1.04 QUALITY ASSURANCE

- A. Standard: Air Movement and Control Association, AMCA Standard 500 Certified Performance.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Ruskin or approved equal by American Warming and Ventilating, Air Balance, Arrow, National Controlled Air, Inc., Cesco, Flexmaster, Honeywell, Johnson Controls, Louvers and Dampers, Tamco, Vent Products, or Airstream.
- B. Manufacturer and Model Number listed under Part 2 shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

### PART 2 PRODUCTS

#### 2.01 CONICAL TAKE-OFF (FOR ROUND BRANCH DUCTS)

- A. Combination Conical Take-Off / Butterfly Damper: Flexmaster Model FLDE. Spin collar 45 deg. scoop, with butterfly damper with adjustable operator.
- B. Option: Flexmaster Model CBDE. Conical Bellmouth fitting, with butterfly damper with adjustable operator.

#### 2.02 EXTRACTORS (FOR RECTANGULAR BRANCH DUCTS)

- A. Tuttle and Bailey "Vectrols." Steel frame and parallel diverting blades, angle bracket, pivot bearing assembly, worm gear operator, and control shaft.
- B. Other Acceptable Manufacturer: Approved equal by Titus or Annemostat.

#### 2.03 SPLITTER DAMPER (FABRICATED)

- A. Steel frame and adjustable diverting blades, angle bracket, pivot bearing assembly, worm gear operator.

2.04 BALANCING DAMPERS (VOLUME DAMPERS)

- A. Galvanized steel, steel blades, molded synthetic bearings, locking quadrant with stand-off bracket.
  - 1. Rectangular for ducts larger than 12 in.: Ruskin Type MD35.
  - 2. Rectangular for ducts 12 in. and smaller: Ruskin Type MD25, single-blade.
  - 3. Round: Ruskin Type MDRS25, single-blade.

2.05 CONTROL DAMPERS (OUTSIDE AIR INTAKE AND EXHAUST ONLY)

- A. Low leakage type, aluminum frame, 6 in. heavy-gauge extruded aluminum airfoil blades, concealed linkage, 1/2 in. hexagonal steel axles, vinyl blade edge seal, molded synthetic bearings, extended 1/2 in. control shaft, motor operator bracket, maximum leakage less than 4 CFM per sq. ft. at 4 in. W.G.
  - 1. Acceptable Manufacturers: Ruskin Type CD-50, American Warming Type VC-29, Vent Products Model 5900, or approved equal by Louvers and Dampers.
- B. Furnish motor-operable dampers. All linkages for operators shall be furnished with dampers.

2.06 DAMPER MOTOR OPERATORS

- A. Operators are specified under Section 23 09 33.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install dampers in ductwork and provide access to adjustments for proper access. Provide stops or adjust the linkage to fix and maintain the balance position.
- B. Provide access doors in duct at each motorized damper location.
- C. Coordinate the selection and installation of motor operators furnished by the Temperature Controls Subcontractor.
- D. Provide a solid place for installation of motor operators. Mount operators furnished under Section 23 09 33.
- E. Ensure balancing damper quadrant operator is exposed after insulating ductwork. Tape insulation around operator to maintain vapor barrier.
- F. Provide access panels on BOTH sides of ductwork for access to dampers.
- G. Provide stops for the motorized damper for balancing the outside air quantity. If the motorized damper is not capable of being used for balancing, then provide manual balancing damper (not shown) on outside air intake separate from motorized damper for balancing.

3.02 WIRING

- A. Provide disconnect switches and 120 volt power for motor operators.
- B. Provide all control wiring.

END OF SECTION 230515

## SECTION 233400.01 - HVAC FANS (EXHAUST FANS)

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 05 12, "HVAC Vibration Isolators."
- B. Section 23 33 13, "Dampers."

#### 1.03 DESCRIPTION

- A. Provide exhaust fans of the following types:
  - 1. Ceiling/inline exhaust fans.
  - 2. Inline centrifugal exhaust fans.
  - 3. Sidewall centrifugal exhaust fans.
- B. Provide curbs, dampers, caps, and other accessories as described below.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. Air Movement and Control Association (AMCA).
    - a. AMCA 210, Fan Performance Rating.
    - b. AMCA 300, Sound Rating.
  - 2. Underwriters Laboratories, Inc. (UL), Fan Assembly.

#### 1.05 RATINGS AND CAPACITY

- A. Size, capacity, arrangements, and location as indicated on the Drawings.

#### 1.06 MOTORS

- A. Unless otherwise noted, high-efficiency motors shall be National Electrical Manufacturers Association (NEMA) Design B, continuous rated with 1.15 service factor, with Class F insulation and Class B temperature rise, copper windings and leads, 1750 RPM with the horsepower indicated on the Drawings. All motors shall be equipped with ball bearings.

### PART 2 PRODUCTS

#### 2.01 CEILING/INLINE EXHAUST FANS

- A. Galvanized steel housing, acoustical lining, control/junction box, field-adjustable discharge duct connection with backdraft damper. Inlet duct connection on inline fans.
  - 1. Fans: Forward curved centrifugal blower wheel(s) shaft-mounted to permanently lubricated motor. Blower and/or motor resiliently mounted to fan housing.
  - 2. Controls: Motor power cord with receptacle plug, fan control as scheduled, unit-mounted variable speed controller, or other devices as shown on the Exhaust Fan Schedule.
  - 3. Aluminum, 1/2 in. mesh bird screen at exhaust grille in exterior soffit.
- B. Acceptable Manufacturers: Greenheck. Approved equal by Penn, Cook, Carnes, or Jenn-Fan.

## 2.02 INLINE CENTRIFUGAL EXHAUST FANS

- A. 18 ga. galvanized steel housing, baked enamel finish, duct flanges, adjustable motor frame mounts, belt guard, and integral support attachments. See Section 23 05 12.
  - 1. Fan wheel: Non-overloading, backward-inclined centrifugal, statically and dynamically balanced, matched venturi inlet, and wheel cones.
  - 2. Motor and drive assembly: AMCA Arrangement #9, motor position A, unless otherwise noted. Single-speed motor, totally enclosed with sealed ball bearings. Drive assembly with adjustable cast iron sheave, sealed ball bearings, extended bearing oilers, and belts sized minimum of 150% of motor horsepower.
  - 3. Accessories: As scheduled on the Drawings.
- B. Acceptable Manufacturers: Greenheck. Approved equal by Cook, Barry Blower, Penn, Carnes, or Jenn-Fan.

## 2.03 SIDEWALL CENTRIFUGAL EXHAUST FANS

- A. Aluminum materials for components in airstream and exposed to weather, including base, shroud, bird screen, and motor cover.
  - 1. Fan wheel: Non-overloading, backward-inclined, centrifugal, statically and dynamically balanced, matched venture inlet, and wheel cones.
  - 2. Motor and drives: Motor and drive assembly supported on elastomeric vibration isolators separated from the air stream and ventilated to the outside. Single-phase motors shall have built-in overload protection. Belt drive units with manual belt adjustment, adjustable cast iron sheave, sealed ball bearings, and belts sized for minimum of 150% motor nameplate horsepower.
  - 3. Controls: Factory-installed, factory-wired disconnect switch in motor compartment in liquid tight conduit, and fan control as indicated.
- B. Acceptable Manufacturers: Greenheck. Approved equal by Cook, Jenn-Fan, Carnes, or Penn.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Provide flexible connections for ductwork attachment to each fan.
- B. Extend discharge duct from inline fan full size to wall or roof outlet as shown on Drawings. On direct drive ceiling fans, provide balancing damper in duct in accessible location (not shown). Option: Provide variable speed controller mounted on unit (concealed) for balancing. Include the cost of mounting and wiring for unit-mounted speed controllers.
- C. Drive belts shall be properly tensioned using a Browning belt tensioner, and aligned by workmen qualified in this Work. Tension at start-up and re-tension after (1) week of operation.
- D. Provide 1/2 in. mesh bird screen at all exterior penetrations, including wall caps and roof caps.

### 3.02 WIRING

- A. Contractor shall provide power wiring, control wiring, and switching.
- B. Contractor shall provide motor starters and disconnect switches for wall fans.
- C. Contractor shall provide disconnect switches for inline centrifugal fans.

- D. Contractor shall provide control wiring shown on the Exhaust Fan Schedule on the Drawings.

END OF SECTION 233400.01



## SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 33 13, "Dampers."

#### 1.03 DESCRIPTION

- A. Provide grilles, registers, and diffusers as indicated on the Drawings.
- B. Service shall be for supply, return, or exhaust as noted on the Drawings.

#### 1.04 QUALITY ASSURANCE

- A. Standard: Air Diffusion Council (ADC).

#### 1.05 RATINGS AND CAPACITY

- A. Size, capacity, arrangements, and location as indicated on the Drawings.

#### 1.06 APPROVED MANUFACTURERS

- A. Anemostat or approved equal by Titus, Krueger, Price, Nailor, or Tuttle & Bailey.
- B. Manufacturer and Model Number listed under Part 2 shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

### PART 2 PRODUCTS

#### 2.01 GRILLES, REGISTERS, AND DIFFUSERS

- A. Factory-fabricated to evenly distribute design CFM throughout the space without causing noticeable drafts. Steel or aluminum. Diffusers, registers, and grilles shall have white, baked enamel finish. All exhaust registers in showers and locker rooms shall be aluminum with mill finish.
  - 1. Grilles: Same construction as registers without volume-control damper.
  - 2. No straight blades will be permitted on return or exhaust grilles or registers. Only curved blades that have a minimum deflection of 45 deg. will be accepted.

#### 2.02 DAMPERS

- A. Diffuser Damper: Anemostat Type CU-1, or Titus Type AG-75 with 90 deg. sectorizing baffles. Opposed blade, heavy-gauge, steel control.
- B. Louver Damper: Anemostat Type LD. Steel louver blades, flat black finish.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Diffusers supplied by flexible ducts shall be fitted with louver damper installed in the diffuser neck.



- B. Do not install combination diffuser/damper on bottom connection to a continuing supply air main duct.
- C. Registers shall be provided with sponge-rubber gasket between flanges and wall or ceiling.
- D. Install ceiling exhaust and return grille/register blades away from normal line of sight into the ceiling space or duct.
- E. Wall supply registers shall be installed at least 6 in. below the ceiling, unless otherwise indicated.
- F. To prevent ceiling from sagging, provide additional support hangers for diffusers, grilles, or registers mounted in lay-in ceiling tiles.
- G. Ensure airtight seal at all connections.

END OF SECTION 232713

## SECTION 233700 – HVAC LOUVERS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, “General Requirements,” Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 23 33 13, “Dampers”

#### 1.03 SUMMARY

- A. Section Includes:
  - 1. Stationary drainable-blade exterior louvers.

#### 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments, to other work. Show blade profiles, angles, and spacing.

#### 1.05 QUALITY ASSURANCE

- A. Louvers shall be AMCA Standard 511.
- B. Coordinate the color, exact location and size with the Architect before ordering. Coordinate with the structural drawings.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
  - 1. Airolite Model series K6776.
  - 2. Construction Specialties, Inc. series A6177
  - 3. Greenheck Model series ESD-635.
  - 4. Ruskin Model series ELF6375DX.

#### 2.02 STATIONARY DRAINABLE-BLADE EXTERIOR LOUVERS

- A. Louvers shall be Architectural style with continuous appearing, evenly spaced stationary blades. Color and finish shall be selected by the Architect. Louvers shall be 0.081-inch extruded aluminum construction. Factory prime coat and finish with baked enamel finish. Louvers shall be complete with birdscreen on interior face and with extended sill.
- B. Louvers shall be stationary drainable blade type, with each stationary blade incorporating an integral horizontal drain gutter and each jamb shall incorporate an integral downspout. Blades to be housed in a 6" louver frame.
- C. Where louver size exceeds fabrication allowances, fabricate louvers to permit field-bolted assembly with close fitting joints in jambs and mullions. Intermediate support mullions shall not interrupt blade appearance when viewed from outside of louver. Assemble louvers in factory to minimize field splicing

and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

- D. Louver shall withstand a wind force of 25 pounds per square foot. Louver frames, mullions, and section joints shall be adequately supported from the building structure to withstand the same wind loading.
- E. Louver performance requirements below based on an AMCA 48" x 48" size. Refer to mechanical drawings for project-specific louver performance requirements.
  - 1. Minimum Free Area: 52.2%
  - 2. Minimum Free Area Size: 8.36 square feet
  - 3. Earliest beginning point of water penetration: 1,023 fpm free area velocity

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Turn louvers over to the General Contractor for installation. Coordinate all exterior wall openings with General Contractor.

END OF SECTION 233733

SECTION 235123.01 - GAS VENTS (LOW HEAT, NATURAL DRAFT)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 RELATED WORK DESCRIBED ELSEWHERE

1.03 DESCRIPTION

- A. Provide a gas vent from each interior natural draft, gas-fired appliance, including pressure washer and radiant heaters.

1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. Underwriters Laboratories, Inc. (UL) 441, for Type B Gas Vent.
  - 2. International Fuel Code.
  - 3. National Fire Protection Association (NFPA) 54 and 211.
  - 4. State Building Code.

1.05 RATINGS AND CAPACITY

- A. Size, capacity, arrangements, and location as indicated on the Drawings.

PART 2 PRODUCTS

2.01 TYPE B GAS VENTS (FOR PRESSURE WASHER AND RADIANT HEATERS)

- A. 3 in. through 8 in.: Metalbestos Model RV. Double-wall metal, with 0.012 in. thick aluminum inner shell and 0.018 in. thick galvanized steel outer jacket separated by at least 1/4 in. insulating air space. Each factory-assembled piece shall create interlocking segments using integral couplings.
- B. Draft hood connectors, elbows, tees, fittings, roof flashing, storm collar, Belmont cap, increasers and reducers, and any other required fittings or accessory shall be made for, and be compatible with, the vent pipe construction and coupling system.
- C. Acceptable Manufacturers: Metal-Fab Model M or approved equal by AMPCO, Van-Packer, Duravent, Schebler Co., or Amerivent.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with Manufacturer's recommendations, including the installation instructions supplied with the product. Support per Manufacturer's instructions.
- B. Contractor shall cut roof, flash vents, and weatherproof the finished installation.
- C. Maintain proper clearance to combustibles.
- D. Pitch all horizontal runs upward away from equipment, at a minimum of 1/4 in. per ft.
- E. Furnish storm collar and flashing for installation.

- F. Extend vent top cap to a point at least 3 ft. above the roof and at least 2 ft. above any part of the building within 10 ft. Provide recommended clearance to other intakes and vents.
- G. Complete vent system shall be installed in accordance with the State Building Code and NFPA 54 and 211.

END OF SECTION 235123.01

## SECTION 238133 – VARIABLE REFRIGERANT HEAT PUMPS

### 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 types of equipment:
  - 1. Indoor horizontal concealed units.
  - 2. Exterior heat pump condensing units, with structural rail and insulated pipe curbs.

#### 1.3 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each model.
- B. Shop Drawings: Manufacturer shall provide complete piping drawing as a part of the submittal package.
- C. Field quality-control test reports.
- D. Operation and maintenance data.
- E. Special warranties.

#### 1.4 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 ASHRAE 15.
- C. Comply with minimum COP/efficiency levels according to ASHRAE/IESNA 90.1.
- D. Comply with NFPA 70.
- E. Comply with safety requirements in UL 484 for assembly of free-delivery heat pumps.
- F. Comply with safety requirements in UL 1995 for duct-system connections.

#### 1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace refrigeration components of heat pumps that fail in materials or workmanship within specified warranty period.
  - 1. For Compressor: One year(s) from date of Substantial Completion.
  - 2. For Parts: One year(s) from date of Substantial Completion.
  - 3. 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:
  - 1. Daikin: VRV IV (or current) System or VRV Aurora High Heat System
  - 2. Mitsubishi Electric: City Multi System or Hyper Heat System

3. Samsung DVM S or DVM S Max Heat

## 2.2 INDOOR HORIZONTAL CONCEALED UNITS

- A. Description: Packaged concealed variable refrigerant flow multi-split air conditioning unit; factory assembled, tested, and rated according to AHRI-ISO-13256-1.
- B. Cabinet and Chassis: Galvanized-steel casing with the following features:
  1. Access panel for access and maintenance of internal components.
  2. Knockouts for electrical and piping connections.
  3. Flanged duct connections.
  4. Cabinet Insulation: Closed cell expanded polyurethane foam liner, minimum 1/2 inch thick, complying with UL 181.
  5. Condensate Drainage: Stainless-steel or foam injection drain pan pitched as required in ASHRAE 62 with condensate drain piping projecting through unit cabinet.

## 2.3 INDOOR UNIT COMPONENTS (ALL UNITS UNLESS OTHERWISE INDICATED)

- A. Fan: Direct driven, centrifugal, with multi-speed motor resiliently mounted in fan inlet.
  1. General requirements for motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
  2. Motor: Multi-speed, permanently lubricated motor.
- B. Refrigerant-to-Air Coils: Copper tubes with aluminum fins, leak tested to 450 psig.
- C. Refrigerant Circuit Components:
  1. Sealed Refrigerant Circuit: Charge with R-410A refrigerant.
  2. Charging Connections: Service fittings on suction and liquid for charging and testing.
  3. Reversing Valve: Pilot-operated sliding-type valve designed to be fail-safe in heating position with replaceable magnetic coil.
  4. Electronic Proportional Expansion Valve: Capable of controlling capacity between 25% and 100%.
  5. Refrigerant Piping Materials: ASTM B 743 copper tube with wrought-copper fittings and brazed joints.
  6. Pipe Insulation: Refrigerant minimum 3/8-inch- thick, flexible elastomeric insulation on piping exposed to airflow through the unit. Maximum 25/50 flame-spread/smoke-development indexes according to ASTM E 84.
  7. Refrigerant Metering Device: Capillary tube.
- D. Filters: Synthetic, washable filter and filter casement, shall have minimum 80 percent arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) of 13 according to ASHRAE 52.2.
- E. Condensate Pump: The unit shall have a drain lift up mechanism able to discharge condensate up to 20' above the drain outlet of the unit.
  1. Were integral to unit, coordinate discharge location with contractor.
  2. Where external to unit is required, this supplier is to provide the pump and coordinate size, wiring and installation to accommodate being fed off main electrical feed to the unit.
- F. Controls:
  1. Basic Unit Controls:
    - a. Low- and high-voltage protection.
    - b. Over-current protection for fan motor.
    - c. Random time delay, three to ten seconds, start on power up.
    - d. Time delay override for servicing.
    - e. Control voltage transformer.

2. Thermostat:
  - a. Wall-Mounted Thermostat:
    - 1) Heat-cool-off switch.
    - 2) Fan on-auto switch.
    - 3) Automatic changeover.
    - 4) Exposed temperature set point.
    - 5) Exposed temperature indication.
    - 6) Deg F indication.
  - b. Wall-mounted temperature sensor.
  - c. Unoccupied period override push button.
  - d. LED to indicate fault condition at unit.
  - e. Data entry and access port via the ANSI/ASHREA Standard 135 (BACnet) and/or ANSI/EIA Standard 709.1-A (LonWorks®) communications protocols. Manufacturer shall provide integration services as required.
    - 1) Input data include room temperature set points for occupied and unoccupied periods.
    - 2) Output data include room temperature and humidity, supply-air temperature, fan status, and operating mode.
3. Additional Monitoring:
  - a. Monitor constant and variable motor loads.
  - b. Monitor cooling load.

#### 2.4 EXTERIOR HEAT PUMP CONDENSING UNIT

- A. Description: Packaged variable refrigerant flow outdoor conditioning unit; factory assembled, tested, and rated according to AHRI-ISO-13256-1. The outdoor unit shall operate in heating mode to -4 degrees F (or -22 degrees F if High Heat) dry bulb ambient temperature without additional ambient controls.
- B. Cabinet: Steel plate casing with the following features:
  1. Access panel for access and maintenance of internal components.
  2. Knockouts for electrical and piping connections.
  3. NEMA-3R enclosure for all electrical control components.
  4. Acrylic paint or baked enamel finish.
- C. Condenser Fan: Direct driven with multi-speed motor
  1. General requirements for motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
  2. Motor: Multi-speed, permanently lubricated motor.
- D. Refrigerant-to-Air Coils: Copper tubes with aluminum fins, leak tested to 450 psig.
- E. Compressors: All compressors in the unit to be inverter-scroll compressors. Staged compressors will not be allowed.
  1. High efficiency scroll compressors.
  2. Heating or cooling mode of the outdoor unit shall be controlled using a combination of 2- and 3-way valves which will reverse the cycle of the refrigerant.
  3. Sealed Refrigerant Circuit: Charge with R-410A refrigerant.
- F. All units marked as "High-Heat" or similar in the contract documents, or show capacities required low ambient heat, must be able to supply full heating capacity down to at least 0°F outdoor air temperature.

#### 2.5 SOLENOID VALVE KIT (SVK)

- A. The SVK box shall be constructed from galvanized steel plate and be no larger than 6 in. X 6.5 in. X 7.1 in. and internally insulated with polyurethane foam. The connection to the system shall be either via brazed connection or flare nuts.



- B. The SVK box shall be connected to each fan coil or group of fan coils via its own dedicated connection, which shall provide power and control signals to the solenoid valves within the box. This cable can reach up to 16 ft. Should longer distances be required, the cable can be extended.
- C. The SVK box shall be mounted outside the conditioned room to ensure that maintenance and operational tests can be carried out without disturbance to the occupants.
- D. Each SVK box will meter the required refrigerant to each fan coil unit to ensure that the room conditions remain at the desired temperature.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Mount outdoor heat pumps on 18" high equipment rails with vibration isolators. Vibration isolators are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- B. Suspend indoor units from structure with threaded steel rods and minimum 0.25-inch static deflection rubber-in-shear vibration isolators. Vibration isolators are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- C. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:
  - 1. Connect refrigerant piping to heat pump with unions and shutoff valves. Flexible refrigerant piping connectors are acceptable.
  - 2. Connect condensate drain pan to indirect waste connection with condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.
  - 3. Install refrigerant shutoff valve with evacuation port on each inlet pipe connection of the branch controller.
  - 4. Provide 18" high insulated pipe curb for refrigerant lines.
- D. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts. Specific connection requirements are as follows:
  - 1. Connect supply and return ducts to heat pumps with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
- E. Install electrical devices furnished by manufacturer but not specified to be factory mounted.
- F. Install piping adjacent to machine to allow service and maintenance.
- G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, . Report results in writing.
  - 1. The contractor shall actively coordinate all unit locations and pipe routing prior to installation with the manufacturer. All changes during construction shall be reviewed by the manufacturer.
  - 2. The factory-authorized service representative shall be on-site during refrigerant piping and unit installation, at least on a bi-weekly basis to review installation, in addition to final sign-off and start-up.
- B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new components, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. The Unit Manufacturer shall provide a factory trained serviceman for a period of not less than 2 days to supervise charging and start-up of the system and instruct the Owner's maintenance personnel in the proper operation and maintenance of the units.

END OF SECTION 238133



## SECTION 238300.01 - RADIANT HEATING UNITS

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Provide a gas-fired infrared tube heating system, including all required tubing, reflector, hangers, burners, combustion chambers, controllers, temperature sensors, etc.

#### 1.02 SUBMITTALS

- A. Submit Manufacturer's mechanical product data, including product description, technical data and installation instructions.
- B. Submit shop drawings showing complete details of installation of gas-fired radiant systems, including layout, suspension, connections, burners, heat exchangers and controls.
- C. Submit wiring diagrams indicating power and control wiring required for system. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.
- D. Submit copy of Manufacturer's current design certification from Canadian Standards Association International (CSA), covering all components approved for use as a gas-fired radiant system.
- E. Submit maintenance data and parts list for each type and size of radiant heaters, including troubleshooting guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual, in accordance with requirements of Schedule E, "Materials Approval Submittal."

#### 1.03 WARRANTY

- A. Provide a written Manufacturer's warranty agreeing to replace/repair, within warranty period, components of gas-fired radiant systems furnished by Manufacturer, which are defective in either material or workmanship, provided Manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to for (3) years from date of Contract Completion of entire radiant heating system, including electrical components. Minimum warranty period shall be Ten (10) years on the heater's burner core, heat exchanger, and combustion chamber tubes
- B. Burner combustion chambers shall have a warranty period of (15) years from date of Contract Completion.

#### 1.04 ACCEPTABLE MANUFACTURERS

- A. Roberts Gordon
- B. Detroit Radiant
- C. *Superior Radiant Products*

### PART 2 PRODUCTS

#### 2.01 RADIANT PIPE HEATING SYSTEM

- A. Burner Assemblies: Heavy-duty cast iron burner heads, pre-wired gas controls with direct spark ignition module, combustion air filters with MINIMUM filtering surface area of 106 sq. in., cast iron combustion chambers with 5/32 in. minimum thickness, and threaded 4 in. pipe fitting for upstream and downstream tubing connection. Steel combustion chambers are not acceptable.

System shall vent all products of combustion outdoors per unit manufacturer's recommendation. Provide minimum number of burners indicated:

1. To ensure proper heat distribution. Fewer burners of larger capacity will not be accepted. Design firing rate of burners shall be as stated on Drawings.
  2. To totally pre-mix air and gas required for combustion.
  3. To maintain constant proportion of fuel gas to filtered combustion air. Introduce both fuel gas and air at atmospheric pressure. If combustion air flow is impeded for any reason, ensure that gas flow rate will decrease in constant proportion to maintain proper gas/air mixture for complete combustion.
- B. Burner Controls: All burners shall be factory-wired for 115 volts AC with transformer for 24 volts AC direct spark ignition (DSI) module operation and supplied with a grounded 24 in. to 30 in. 3-wire pigtail located at rear of burner.
1. Fail-Safe Controls: To ensure a high degree of fail-safe operation, system shall shut off main flow of gas if any or all of the following abnormal conditions occur:
    - a. Power fails. (Gas valves in burners close in safe position.)
    - b. Main valve fails in open position.
  2. DSI Module: All gas vacuum-firing burner units shall be equipped with a DSI module with a (15) second flame response time per ignition trial before lockout occurs. DSI module shall be capable of a minimum of (3) trials for ignition. Spark shall shut off when burner flame is established.
- C. Radiant Piping Heat Exchanger: 4 in., 16 ga. heat-treated aluminized steel radiant pipe tubing. 4 in., 16 ga. steel tail pipe tubing with acid-resistant porcelain coating, and 0.92 or greater emissivity factor. All connections shall be made with stainless steel couplings. Each open-end combustion chamber shall have an approved end vent. Reflector shall terminate with an end cap. All piping must be supported in accordance with acceptable practices, local codes, seismic requirements, applicable standards, and as shown on Drawings. Pipe shall pitch down at least 1/2 in. in 20 ft. on radiant lines, and 1 in. in 20 ft. on tail pipe lines toward end vent.
- D. Reflectors: 0.024 1100 H18 mill finish aluminum, or other highly radiant reflective material reflectors, installed over complete exchanger, using a deep-dish design with lower edge of reflector extending beyond bottom of heat exchanger tube. Standard reflectors shall be installed on all radiant pipe and tail pipe over entire pipe network. Provide reflector joint pieces over heat exchanger fittings such as elbows, crosses, and tees, end vents, and pipe, so reflector covers heat exchanger continuously.
- E. Outside Air: Provide CSA-approved fresh outside air system to supply each burner and end vent for support of combustion, if required.
- F. Control Panel Indoor Electric Zone Temperature Sensors: Standard panel with 12 vdc. programmable sensor. Mount sensors 4 ft. above finished floor, or otherwise as noted. Provide insulated base where sensor is mounted on an exterior wall.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install gas-fired radiant pipe systems as indicated, in accordance with Manufacturer's installation instructions, in compliance with applicable codes and approvals, and as shown on Drawings.
- B. Suspend heat exchangers, burners, gas piping, conduit, and reflectors from building structure as specified elsewhere, in order to provide a durable and safe installation, in accordance with Manufacturer's installation instructions, and as shown on Drawings.

- C. Do not exceed minimum clearance to combustibles outlined and printed on burner nameplate, and in Manufacturer's product data. Measure clearance distance from surface of heat exchangers.
- D. Install vent piping as indicated. Terminate where indicated with bird screen cover.
- E. Plumbing Contractor shall install gas piping in accordance with Manufacturer's installation instructions.
  - 1. Connection from supply line to burner unit must be made in accordance with installation instructions.
  - 2. Gas shut-off cock, as supplied with unit, and controls in unit must not be subjected to more than 1/2 lb. or 14 in. W.C. pressure. If high pressure testing of gas supply line is required, this test must be made with a plug in 1/2 in. branch line to each burner. Never test gas line with shut-off cock installed or burner unit connected.
- F. Mount electronic zone temperature sensors 4 ft. above finished floor, if not otherwise indicated.

### 3.02 FIELD QUALITY CONTROL

- A. Start up and adjust gas-fired radiant heaters in accordance with Manufacturer's instructions and Gas Utility Company's requirements. Check and calibrate controls. Adjust burners for maximum efficiency.

### 3.03 TRAINING

- A. Provide services of Manufacturer's Technical Representative to instruct the Owner's operating personnel in operation and maintenance of gas-fired radiant heaters.

### 3.04 WIRING

- A. Electrical Contractor shall wire sensors using shielded cable, Belden 8451, or equivalent.

END OF SECTION 238300.01



## SECTION 238342 - ELECTRIC HEATING UNITS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Provide electric heating units of the following types:
  - 1. Electric wall heaters.
  - 2. Suspended electric unit heaters.

#### 1.03 QUALITY ASSURANCE

- A. Standard: Underwriters Laboratories, Inc., (UL) Label.

#### 1.04 RATINGS AND CAPACITY

- A. Size, capacity, arrangements, and location as indicated on the Drawings.
- B. Wattage and voltage ratings shall be as indicated on the Drawings.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Q-Mark or approved equal by Singer, Markel, Berko, Raywall, or Nutone.

### PART 2 PRODUCTS

#### 2.01 ELECTRIC WALL HEATERS

- A. Q-Mark Type AWH. UL-listed, semi-recessed, heavy-duty, fan-forced, totally enclosed fan-cooled motor, built-in disconnect switch, nickel-chrome heating elements, high temperature cutouts, tamper-resistant integral thermostat, 16 ga. steel housing, baked enamel finish, satin aluminum trim. The A/E will select the finish. See section 1.05 for equal manufacturers.

#### 2.02 SUSPENDED ELECTRIC UNIT HEATERS

- A. Raywall UH Series. UL-listed, suspended, propeller fan, built-in disconnect switch, nickel-chrome heating elements, high temperature cutouts, tamper-resistant integral thermostat, 16 ga. steel housing, baked enamel finish. The A/E will select the finish. See section 1.05 for equal manufacturers.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Mount wall unit no closer than 12 in. to the floor or adjacent wall surface.
- B. Surface mount wall unit.
- C. Suspend propeller unit heaters from structure with all-thread hanger rods. Hanger rods and attachments to structure are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in Division 23 Section "HVAC Vibration Isolators."



D. Install propeller unit heaters level and plumb.

3.02 WIRING

A. Contractor shall provide power wiring.

END OF SECTION 238342

## SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.
- B. Refer to the following Divisions and Sections for specific requirements, responsibilities, and methods relating to Division 26 Work:
  - 1. Division 00, "Procurement and Contracting Requirements":
    - a. Section OM 00 21 13, "Instructions to Bidders."
    - b. Section OM 00 30 00, "Available Information."
    - c. Section OM 00 72 00, "General Conditions."
    - d. Section OM 00 73 00, "Supplementary Conditions."
  - 2. Division 01, "General Requirements," Section OM 01 23 00, "Alternates."
  - 3. Division 03 "Concrete," Section OM 03 30 00, "Cast-in-Place Concrete."
  - 4. Division 09, "Finishes," Section OM 09 91 00, "Painting."
  - 5. Division 23, "Heating, Ventilating, and Air Conditioning":
    - a. Section OM 23 73 39.03, "Indoor Direct Gas Fired Heating and Ventilation Units (Make-Up-Air)."
    - b. Section 23 83 42, "Electric Wall Heaters."
  - 6. Division 26, Sections OM 26 00 00 through OM 26 99 99 (as included). Contractor is responsible for the Work described in these Sections, Listed below.
  - 7. Division 27, "Communications" (communications work by the Contractor):
    - a. Section OM 27 07 00, "Special Communications Systems."
    - b. Section OM 27 11 00.04, "Communications Equipment Room Fittings."
  - 8. Division 28, "Electronic Safety and Security":
    - a. Section OM 28 07 00, "Special Electronic Safety and Security Systems."
    - b. Section OM 28 31 00.01, "Fire Detection and Alarm."
  - 9. Division 33, "Utilities," Section OM 33 70 00.01, "Electrical Utilities."

#### 1.02 DESCRIPTION

- A. Furnish material, labor, tools, accessories, and equipment to complete and leave ready for operation all electrical systems of this Project as described in these Specifications and as shown on the Drawings.
- B. It is the intent that the Electrical Work be complete in every respect. Install Work in compliance with the Latest Enforced Edition of all applicable Codes, Regulations, and Standards, unless otherwise noted. Obtain all permits, licenses, and certifications required by the Code Authority having Jurisdiction.
- C. Only a Contractor and craftsmen licensed by the State shall install this Electrical Work.
- D. Use sufficient journeymen electricians and competent supervisors in execution of this portion of the Work to ensure proper and adequate installation throughout. In the acceptance or rejection of installed electrical system, no allowance will be made for lack of skill on the part of workers.

- E. Shop drawings for the installation of an electrical system shall be submitted and reviewed by the A/E before any electrical system is installed, enlarged, or extended. Under NO circumstances shall any Work be performed prior to receiving shop drawings reviewed by the A/E.
- F. Coordinate location of all work and equipment.
- G. Work includes, but is not limited to, the following:
  - 1. Alternates.
  - 2. Concrete conduit encasement and pull box encasement.
  - 3. Install HVAC variable speed drive.
  - 4. Electric heating: Wall heaters.
  - 5. Control wiring.
  - 6. Fuel station wiring.
  - 7. Lighting controls.
  - 8. Power systems.
  - 9. Back-up power systems.
    - a. Generator.
    - b. Automatic transfer switch.
  - 10. Transient voltage surge suppressor.
  - 11. Lighting systems.
  - 12. Telephone/data system.
  - 13. Public address intercom system.
  - 14. Fire alarm system.
  - 15. Carbon monoxide detection system.
  - 16. Site electrical systems: Refer to Section 33 70 00.01.
- H. Work Not Included:
  - 1. The Owner shall provide the following work directly or through a separately negotiated Contract:
    - a. Telephones and related switching equipment.
    - b. Computers and modems.
    - c. Security system equipment and wiring.
- I. The electrical system shall not be considered complete and acceptable unless, and until, all Code and Governing Agency requirements are satisfied.
- J. Refer to Division 01 and Section 26 05 60, "Requirements for Completion of Electrical Work," for additional requirements.

### 1.03 ALTERNATES

- A. Refer to Section 01 23 00 for a complete description of Alternates.

### 1.04 STANDARDS OF QUALITY

- A. Contractor shall provide Work of the highest quality, conforming to the accepted practices and standards of the Trades involved
- B. Any Law, Code, Standard, or Regulation referred to in other Sections of Division 26 is included in its entirety as a part of these Specifications.
- C. The following Codes apply to this Work:
  - 1. State of Ohio: 2007 Building Code.
  - 2. National:
    - a. 2008 National Electrical Code.
    - b. Americans with Disabilities Act (36 CFR 1191).

- c. National Fire Protection Association. Codes as listed in subsequent Specification Sections.
- D. Licensed Contractors shall perform Work as required by State Codes.
- E. Fire alarm Work shall be performed only by licensed and certified Fire Alarm Installers.
- F. Methods and materials shall be certified where noted in the individual Specification Sections.
- G. All equipment, fixtures, devices, and wiring shall be listed by Underwriters Laboratories, Inc.
- H. All equipment and appliances installed on this Project shall bear the label of an Approved Testing Agency, and shall be installed in accordance with the Manufacturer's instructions for the labeled equipment and appliances.
- I. All structural steel used on this Project shall be manufactured in the United States, per Ohio Revised Code 153.011.

#### 1.05 CONTRACT DRAWINGS

- A. Drawings are schematic and show approximate locations, general arrangement, and extent of Work. Verify exact locations in the field.
- B. The A/E shall approve, in writing, significant deviations from Drawings.
- C. The A/E reserves the right to make minor changes in location that do not require additional labor or material, up to the time of roughing-in, without additional cost. The A/E reserves the right to determine what is "significant" and what is "minor."
- D. If a conflict occurs between the Drawings and Specifications, immediately submit a written request for an interpretation or clarification from the A/E, who shall determine which interpretation has precedence. Refer to Article 1.5 of the General Conditions.

#### 1.06 EXAMINATION OF SITE

- A. Certain conditions may affect the manner or sequence of the performance of the Work. Services, structures, and operating schedules may need to be reviewed prior to bidding to facilitate the installation of the Work without disrupting the normal operation of the facility.
- B. Before submitting its Bid, the Contractor should visit the site of the proposed Project. After receipt of Bids, no allowances will be made for lack of knowledge of Project conditions.
- C. Verify and reconcile Work required by the Contract Documents with existing conditions at the Site.
- D. Should the Contractor note any discrepancies during the Bidding Period, it shall notify the A/E immediately, in writing, to permit issuance of an Addendum to prevent misunderstandings at a later date.

#### 1.07 APPLICABLE CODES, LICENSES, PERMITS, FEES, AND NOTICES

- A. The Owner will submit all Contract Drawings and Specifications to the State of Ohio Department of Commerce, Division of Industrial Compliance, Bureau of Construction Compliance, pay the application fee to secure Plan Approval, and obtain and pay for the Plan Approval Certificate.
- B. Submit Fire Alarm drawings, battery calculations, and equipment cut sheets for approval to State of Ohio Department of Commerce, Division of Industrial Compliance, Division of State Fire Marshal, or other Code Authority having Jurisdiction.
- C. Secure and pay for the State building permit, and any ADDITIONAL permits, governmental fees, bonds, licenses, and inspections required for the proper execution and completion of the Electrical Work.

- D. Pay for all other fees and other charges related to Electrical Work and payable to Utility Companies or Code Enforcement Agencies.
- E. Arrange for both temporary and permanent electrical service with the Power Company, and pay all fees and charges required by the Power Company in connection with the electrical service. Refer to Section 01 21 00, "Allowances."
- F. Give notice and comply with all Laws, Ordinances, Rules, Regulations, and lawful orders of the Code Authority having Jurisdiction bearing on the performance of the Electrical Work.
- G. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, it shall promptly notify the A/E in writing, and any necessary changes will be arranged by the A/E.
- H. If the Contractor performs any Work knowing it to be contrary to such Laws, Ordinances, Rules, and Regulations, and fails to give prior notice to the A/E, the Contractor shall assume full responsibility for, and shall bear all costs associated with, correcting the Work.

#### 1.08 COORDINATION

- A. Contractor shall coordinate its Work carefully.
- B. Coordinate locations of all lighting fixtures and other electrical items, including smoke detectors, electrical equipment, speakers, conduits, and equipment with ceilings, soffits, diffusers, grilles, registers, sprinklers, structural members, joists, purlins, metal decks, bracing, piping, ductwork, hangers, mechanical equipment, etc.
- C. Consult all Contract Drawings that may affect the location of any equipment, devices, panels, and wiring and conduit, and make any other adjustments in location as necessary to secure coordination.
- D. Contractor shall be responsible for the cost of additional engineering work required for changes to the work as shown or described, due to the relocation of items requested by the Contractor.
- E. Review all equipment nameplate ratings and advise the A/E immediately of any system design changes required to wire the equipment properly.

#### 1.09 UTILITIES AND OUTAGES

- A. Locate and touch all existing utilities prior to construction. Where necessary to make minor relocations to permit installation of the Electrical Work, make all such relocations. Advise the A/E immediately of major conflicts to permit modification of the Contract Documents prior to bidding.
- B. Coordinate any utility service shutdowns or outages with the A/E and Owner. Conform to all Utility Company requirements. Avoid inconveniencing the Owner. Provide temporary service during the curtailment, if required by the A/E.
- C. Notify the Owner at least (2) working days in advance of commencing work in the area of existing utilities.
- D. Contractor shall alert occupants of nearby premises of any emergency conditions that arise as a result of its work in connection with existing utilities.

#### 1.10 RECORD DRAWINGS

- A. Maintain, at the job site, (1) set of Drawings and Specifications that shall be used exclusively for documenting and recording the exact location of all installed Work.
- B. Record the location of all concealed utilities on the Record Drawings.

- C. Record deviations in locations of concealed conduit and wiring, equipment, and all buried or concealed utility services, etc., dimensioned from a fixed control point, including depth of bury, for further reference.
- D. Record all Addendum and Change Order Items.
- E. Record deviations made necessary to incorporate equipment different from the Design Base equipment.
- F. Contractor shall deliver (1) copy of its Record Drawings to the A/E.

#### 1.11 GUARANTEE

- A. Contractor shall guarantee its equipment, workmanship, and materials for a period of (1) year from the date of Contract Completion. Should defects develop within this period, the Contractor shall, at no cost to the Owner, remedy the defects and reimburse the Owner for all damage to other Work caused either by the defects or as a result of the work of correcting the same.
- B. Refer also to Division 01 and other Specification Sections that define the starting date of the guarantee period, or that discuss either additional warranty requirements, or extended equipment warranties beyond the standard period.

#### 1.12 ABBREVIATIONS AND SYMBOLS

- A. Titles and abbreviations may be used in these Specifications. Abbreviations may be shown on Electrical Drawings. Refer to the list of abbreviations attached to this Section. Refer also to Section 01 42 00 and the symbols lists shown on the Drawings for further abbreviations. All titles and abbreviations may not necessarily apply to this Work.

#### 1.13 DEFINITIONS

- A. "Provide": To furnish, install, and connect to make completely ready for regular operation.
- B. "Furnish": To supply or deliver to site complete with all required accessories and installation instructions.
- C. "Install": To mount, erect, hang, or fasten in place, and connect to make ready for regular operation.
- D. "Concealed": Either embedded in masonry or other construction, or installed below floor slab, behind wall furring, within chases or soffits, within walls, within double partitions, above ceilings, in trenches, in tunnels, or within crawl spaces.
- E. "Exposed": In full or partial view; not "Concealed" as defined above.
- F. "Accessible Ceiling": Lay-in ceiling with removable ceiling tiles.
- G. "Low Voltage": Systems or wiring operating at potentials less than 48 volts.
- H. Refer to additional Definitions in Division 01, and the State Building Codes.

## PART 2 PRODUCTS

### 2.01 DESIGN BASE MANUFACTURER STANDARD

- A. The Drawings and Specifications are based on the specific equipment requirements and configuration for a Design Base Manufacturer. Design coordination of equipment with the building and with other Trades has been made for this specific Model and Manufacturer of equipment. Where several Manufacturers are listed for an item of equipment or material, the first-named shall be considered the Design Base Manufacturer Standard.

- B. Consideration will not be given to any other Manufacturer that the Contractor proposes to use, unless the Manufacturer has been approved by the A/E and specifically named in the Contract Documents or Addenda thereto.

#### 2.02 OTHER MANUFACTURERS

- A. Any specified Equipment Manufacturer furnished by the Contractor other than the Design Base Manufacturer shall be, in the opinion of the A/E, equivalent in quality, design, features, performance, arrangement, and appearance to that of the Design Base equipment or material, including any special features or requirements.
- B. No consideration will be given to any Manufacturer which the Contractor proposes as an "Approved Equal," unless the Manufacturer has been approved by the A/E during the bid period as provided for in Instructions to Bidders (IB), Paragraph 2.5, and specifically named in the Contract Documents or Addenda thereto.
- C. Recognizing that since no two Manufacturers are "identical," whenever the Contractor elects to furnish specified equipment or material manufactured by other than the Design Base Manufacturer, the Contractor shall be responsible for the cost and coordination of all modifications required to accommodate the elected equipment or material, including any Work of other Trades that might be affected. Where changes to other Trades' Work are required, the Contractor shall include the additional costs of all such Work in its bid.
- D. Where deemed necessary by the A/E, the Contractor shall, at no additional cost to the Owner, prepare new layouts for these other brands of equipment which may have different dimensional or service requirements from the Design Base Manufacturer Standard. Submit these layouts to the A/E for review.
- E. Reimburse the A/E for the cost of any design changes incurred by the A/E in the preparation of revised Drawings or Specifications to accommodate the use of any Manufacturer other than the Design Base Manufacturer.

#### 2.03 ALTERNATIVE MANUFACTURERS

- A. Contractor shall submit information, in accordance with Instructions to Bidders (IB), Paragraph 2.5, on any proposed equipment or material that it desires to use as an Approved Equal.
- B. If the A/E determines an alternative Manufacturer to be acceptable, it will issue an Addendum adding that Manufacturer to the Specification.

#### 2.04 EQUIPMENT SUITABILITY

- A. All equipment provided shall perform as intended. All items listed shall function properly, and as the Manufacturer intended. Install equipment according to the Manufacturer's recommendations. Properly attach equipment to the floor, wall, or structure. Each item of equipment shall be compatible with all other accessories or hook-ups, including controls, wiring, and other equipment that are not furnished by the equipment Manufacturer, but that are required as an accessory or modification, as necessary to achieve its intended function.

#### 2.05 MISCELLANEOUS ACCESSORIES

- A. Provide any additional adapters, fittings, trim, structural steel angles, channels, unistrut, brackets, etc., as necessary to securely mount and install all items of equipment specified or shown on the Drawings.
  - 1. All steel installed outside or exposed to moisture shall be hot-dipped galvanized.
  - 2. All miscellaneous brackets, etc. installed inside and within 5 ft. of Salt Barns and Mix Buildings and within 12 ft. of Brine Making and Calcium Chloride areas are to be 316 stainless steel or FRP.

- B. These accessories are required even though they may not be shown or detailed on the Drawings.
- C. Installation shall be compatible with the building construction on which the item is to be located.
- D. Verify the type of construction prior to ordering the equipment item, so that all required accessories are included.

#### 2.06 QUANTITIES

- A. Equipment may be referred to in these Specifications, or on the Drawings, as either singular or plural; the Contractor shall verify the exact number of items required to complete its Work.

### PART 3 EXECUTION

#### 3.01 EQUIPMENT PROTECTION

- A. Unless equipment and material can be protectively stored in a manner acceptable to the A/E, it shall not be delivered to the site until the Work is ready to receive it.
- B. Protect all equipment and materials during construction from damage by weather, water, dirt, paint droppings, welding and cutting spatters, and other construction activities.
- C. All materials or equipment stored outside shall be elevated and protectively covered in a secured and locked area.
- D. Store materials and equipment sensitive to weather or construction conditions inside. Where necessary, store sensitive equipment in a heated area.
- E. During construction, cover all fixtures, panels, controls, equipment, and other items that are susceptible to damage until they can be installed in place.
- F. Immediately repair or replace damaged equipment or materials to the satisfaction of the A/E and at no additional cost to the Owner.
- G. Contractor shall protect the building and all material and equipment from damage caused by its Work. Protect floors from cutting oil and chips.
- H. Use all means necessary to protect materials before, during, and after installation.
- I. Refer also to individual Specification Sections for specialized protection.

#### 3.02 SAFETY

- A. Exercise precaution for the protection of persons and property. Provide guard rails, barricades, enclosures, canopies, passageways, lanterns, warning lights, and other protective safety devices as necessary or required by the Code Authorities having Jurisdiction, and as required to protect persons and property against accidentally dropped materials or other construction hazards.
- B. Contractor shall be solely responsible for construction means, methods, techniques, sequences, procedures, and safety precautions and programs in connection with the Work. The Owner or A/E will not be responsible for the Contractor's failure to employ proper safety procedures.
- C. Contractor shall be solely responsible for the structural design of all temporary items that it uses in the construction of the building, or that become a permanent part of the building, including, but not limited to, hoisting, shoring for concrete and masonry work, the temporary bracing for structural steel, the shoring of cut earth banks, suspended ceilings, equipment, walls, etc.
- D. Provide protection as may be required to prevent glass breakage. Replace broken glass at no cost to the Owner.



- E. All procedures shall comply with the latest regulations of the Occupational Safety and Health Administration.

### 3.03 EQUIPMENT OPERATION SAFETY

- A. Make provisions for locking off and tagging out disconnect switches or other power control devices in accordance with the requirements of Federal OSHA Regulations CFR 1910.147 and NFPA 70E, Part II, Chapter 5.

### 3.04 AIR HANDLING PLENUMS

- A. Where space is used for air handling, such as above ceilings and elsewhere, do not install combustible or noxious materials.
- B. All materials shall be listed for use in air handling plenums. All wiring shall be UL 910-listed.

### 3.05 EQUIPMENT ACCESS

- A. Locate all units to provide sufficient access to operate equipment or service other items requiring periodic maintenance.

### 3.06 ACCESS PANELS

- A. Unless otherwise noted, the Contractor shall provide all access panels required for concealed electrical work as shown on the Architectural Drawings.

### 3.07 BLOCK COURSE COORDINATION

- A. The mounting heights of items are called out on the Drawings for many items. Adjust equipment mounting heights to accommodate brick or block coursing. Coordinate installation of all items in a masonry wall with the A/E.

### 3.08 CONCRETE WORK

- A. The Contractor shall provide concrete bases, pads, pipe protection bollards, lighting pole bases, and grade-mounted light bases, and all steel reinforcing bars and mesh.
- B. Locate and size any embedment items associated with pads, bases, or curbs for its equipment.
- C. Provide a 3 in. minimum concrete envelope around underground conduits and grade-mounted pullboxes.
- D. Furnish anchor bolts, boxes, conduit, sleeves, or any other items required to be in precast concrete or poured-in-place concrete along with full information in time to cause no delay in the Work.
- E. Contractor shall be responsible for timely notification and coordination of this work.
- F. All concrete shall be 5,000 PSI minimum and placed in accordance with applicable ACI Standards. Refer to Section 03 30 00.

### 3.09 CUTTING AND PATCHING

- A. All cutting and patching shall be accomplished in a neat and workmanlike manner, acceptable to the A/E.
- B. Cutting:
  1. Contractor shall perform all cutting required for installing its Work.
  2. Cutting shall be done with such tools and methods so as to prevent unnecessary damage to surrounding areas and equipment.
  3. Use rotary drills where the cutting of holes through concrete, brick, plaster, or tile is necessary.

4. No cutting shall be done that will, in any way, reduce the structural strength of the building. Cutting of structural support beams, joists, plates, or other structural members is strictly prohibited without the specific written consent of the A/E and the Structural Engineer. Should such cutting be necessary, consult the A/E and do not proceed further without written approval of the A/E.

C. Patching:

1. Contractor shall be responsible for patching.
2. Only a qualified Finish Tradesman, skilled in the respective craft required, shall perform patching.
3. Patching shall match adjacent surface construction.
4. Materials and equipment used in the patching work shall comply with requirements of other Sections of this Specification relating to material to be used in new construction.

- D. All cutting and patching shall be done promptly, and all repairs shall be made as necessary to leave the entire Work in good condition, including all cutting, fitting, and drilling of masonry, concrete, metal, wood, plaster, and other materials as specified or required for proper assembly, fabrication, installation, and completion of the Work.

- E. Coordinate drilling, welding, etc. and method of attachment to columns, joists, beams, purlins, etc., with the Structural Engineer before proceeding.

F. Underground Conduit:

1. Avoid the necessity of cutting of concrete by roughing-in conduit before concrete or pavement is installed. Coordinate carefully.
2. Contractor shall excavate and backfill for its own work.
3. Contractor shall be responsible for any other repairing of excavated areas.
4. Coordinate for removal and replacement of portions of floor slab, exterior paving, or exterior sidewalk to permit installation of underground conduit.

G. Precast Concrete Work:

1. Contractor shall coordinate any holes it requires in precast concrete work during the precast shop drawing process.
2. In lieu of sleeves in precast concrete work, cut holes after erection of concrete.
3. Verify with the A/E that all openings to be field-cut are in conformance with the Precast Manufacturer's specifications before any cutting or drilling proceeds.

- H. Cutting and patching includes remodeling and repairing of previously graveled or paved areas, walks, curbs, sod, floors, etc., as may be required. Saw cuts shall be done in neat, straight lines except in areas shown to be repaired by the Contractor.

- I. Contractor shall repair or replace any roads, sidewalks, or other items that its employees may damage during the performance of this Work.

### 3.10 PAINTING AND RELATED WORK

- A. ALL PAINTING SHALL BE DONE BY A QUALIFIED TRADESMAN SKILLED IN THE CRAFT.

- B. Contractor shall be responsible for finish painting of walls, ceilings, and other Architectural items in the areas of construction.

- C. Contractor shall repaint any previously finished areas disturbed by its own cutting and patching. Painting of the patched area shall match color of the adjacent construction in the general area of the patch. Repaint the entire wall-to-wall and floor-to-ceiling surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.

- D. Clean, spot-prime with zinc chromate, and finish equal to the original quality any factory-finished equipment that has rusted, has been damaged, or has deteriorated. Repaint the entire surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.
- E. Clean, remove rust from, and paint with zinc-chromate primer any electrical support steel and bare ferrous metal, which is not factory-painted, shop-painted, or galvanized, and which remains exposed to view in the finished areas of the building, including mechanical/electrical rooms and storage rooms.
- F. Clean, remove rust from, and paint with zinc-chromate primer and aluminum-bronze paint all steel hangers, boxes, straps, and rods, furnished under this Contract, which are not provided with rust-protective finish or are damaged in installation, and which remain exposed to view or are in unfinished and mechanical spaces.
- G. Paint with a prime coat any ferrous metal installed outside the building that is not factory-painted, shop-painted, or galvanized.
- H. Prime and paint all wood mounting panels with (2) coats gray flameproof paint, both sides and edges.
- I. Where painting has already been done, paint all conduits and Wiremold raceways that are later run exposed in "finished" areas. Color shall match structure, ceiling, or wall background.
- J. Paint all junction boxes containing fire alarm wiring red.
- K. Paint all junction boxes containing emergency power system wiring orange.
- L. Refer to Section 09 91 00 for additional requirements.

### 3.11 CLEANING

- A. Maintain all work areas in a neat and orderly manner, free of debris. Clean up all occupied travel areas at the end of each shift, or immediately after use for material removed.
- B. It is the intent of the Specifications that the Contractor shall do all cleanup, move materials that are in the way of construction, repair and replace any damage it does, and do any other work of a similar nature which must be done.
- C. Upon completion of Work, thoroughly clean all fixtures, material, and equipment of stickers, dirt, grease, rust, oil, and other foreign matter. Prepare for finish painting, where painting is specified.
- D. Before final acceptance of the work, thoroughly clean all finished surfaces of equipment of dirt and dust, and touch up all scratched or damaged surfaces with matching material. Repair dents and marred finishes to the satisfaction of the A/E.
- E. Clean interiors of all enclosures of dirt and debris before installing trim or covers.
- F. Brush-clean, prime, and paint-in-kind rust spots on any part.

### 3.12 FACTORY INSTALLATION AND START-UP

- A. For those items of equipment that are to be installed, tested, started up, and certified by a factory-trained Representative, furnish a letter from the Factory to the A/E stating that this service shall be provided for this Project, describing the scope of services to be provided, and disclosing the name of the Representative assigned to provide the required services.

TITLES, ABBREVIATIONS, AND SYMBOLS

&	And	BAL.	Balancing
@	At	BFP	Backflow preventer
∠	Angle	BHP	Brake horsepower
∅	Diameter	BLDG.	Building
#	Number	BSBD.RAD.	Baseboard radiation
∅	Round OR Phase	BSMT.	Basement
A.	Compressed air	BTM.	Bottom
A.D.	Access door	BTU	British thermal unit
A.D.	Area drain	C.B.	Catch basin
A.F.F.	Above finished floor	C.I.	Cast iron
A.P.	Access panel	C.O.	Clean out
AABC	Associated Air Balance Council	C/C	Center to center
AB.	Above	C/L	Center line
ACI	American Concrete Institute	CAB.	Cabinet
ACPA	American Concrete Pipe Association	CAP.	Capacity
ADA	Americans with Disabilities Act	CEIL./CLG.	Ceiling
ADC	Air Diffusion Council	CFH	Cubic feet per hour
AH	Air handler	CFM	Cubic feet per minute
ALT.	Alternate	CGA	Compressed Gas Association
ALUM.	Aluminum	CHEM.	Chemical
AMCA	Air Movement and Control Association	CISPI	Cast Iron Soil Pipe Institute
ANSI	American National Standards Institute	COL.	Column
APPROX.	Approximately	COMB.	Combination
ARCH.	Architect	CONC.	Concrete
ARI	Air-Conditioning and Refrigeration Institute	COND.	Condensate OR Condenser
ARR'T.	Arrangement	CONN.	Connection OR Connect
ASA	Acoustical Society of America	CONST.	Construction
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers	CONTR.	Contractor
ASME	American Society of Mechanical Engineers	CONV.	Convector OR Converter
ASSE	American Society of Sanitary Engineers	COORD.	Coordinate
ASTM	American Society for Testing and Materials	CS	Commercial Standard
AUTO.	Automatic	CSA	Canadian Standards Association
AV	Acid vent	CU.FT.	Cubic feet
AW	Acid waste	CUH	Cabinet unit heater
AWS	American Welding Society	D.	Deep
AWWA	American Water Works Association	D.F.	Drinking fountain
B.D.D.	Backdraft damper	D.L.	Door louver
B.T.	Bathtub	D.M.	Damper motor
B.V.	Backwater valve	D.S.	Downspout
		DB	Dry bulb
		DBL.	Double
		DCW	Domestic cold water
		DET.	Detail
		DHW	Domestic hot water
		DHWR	Domestic hot water return
		DIA. / ∅	Diameter
		DIFF.	Diffuser
		DIM.	Dimension
		DISCH.	Discharge

DN.	Down	FT.HD.	Feet of head
DPR.	Damper	FURN.	Furnish(ed)
DR.	Door	<hr/>	
DW	Distilled water	G	Gas
DWG.	Drawing	G.I.	Grease interceptor
DWH	Domestic water heater	GALV.	Galvanized
DWV	Drain, waste and vent	GEN.	General
<hr/>		GPM	Gallons per minute
E.A.T.	Entering air temperature	GR	Grille
E.S.P.	External static pressure	GRAV.	Gravity
E.T.	Expansion tank	<hr/>	
E.W.T.	Entering water temperature	H./HT.	Height
EA.	Each	H.P.	High pressure
EFF.	Efficiency	H.S.	Hair strainer
ELEC.	Electric OR Electrical	H'STAT	Humidistat
ELEM.	Element	HAC	Heating and air conditioning
ELEV.	Elevation	HB	Hose bibb
ENGR.	Engineer	HHS	United States Department of Health and Human Services
ENT.	Entering	HORIZ.	Horizontal
EPA	Environmental Protection Agency	HP	Horsepower
EQUIP.	Equipment	HPC	High pressure steam condensate
EW	Eye wash	HPS	High pressure steam
EWC	Electric water cooler	HTG.	Heating
EXH.	Exhaust	HTR.	Heater
EXIST.	Existing	HUD	United States Department of Housing and Urban Development
EXT.	Exterior	<hr/>	
F & T	Float and thermostatic	HV	Heating and ventilating OR High velocity
F.	Fan OR Fire	HVAC	Heating, ventilating, and air conditioning
F.D.	Fire damper	<hr/>	
F.E.	Fire extinguisher	I.D.	Inside diameter
F.E.C.	Fire extinguisher cabinet	IEC	International Electrotechnical Commission
F.H.	Fire hydrant	ICC A117.1	Accessibility Standard
F.H.C.	Fire hose cabinet	IN.	Inside OR Inches
F.H.E.C.	Fire hose/extinguisher cabinet	IND. U.	Induction unit
F.V.	Flush valve	IND.	Indirect
FCC	Federal Communications Commission	INSUL.	Insulation
FD	Floor drain	INT.	Interior
FDA	Food and Drug Administration	INV.	Invert
FHA	Federal Housing Administration	INV. ELEV.	Invert elevation
FIG.	Figure	IRI	Industrial Risk Insurers
FIN.	Finish	ISO	International Organization for Standardization
FIN.RAD.	Finned radiation	<hr/>	
FLEX.	Flexible	J.R.	Janitor's receptor
FLR. / FL.	Floor	JCAH	Joint Commission for Accreditation of Hospitals
FMG	Factory Mutual Global	<hr/>	
FOR	Fuel oil return	L.	Length
FOS	Fuel oil supply	L.A.T.	Leaving air temperature
FPM	Feet per minute	<hr/>	
FT.	Feet	<hr/>	

L.W.T.	Leaving water temperature
LAB	Laboratory
LAV	Lavatory
LH	Left hand
LPC	Low pressure steam condensate
LPS	Low pressure steam
LV'G.	Leaving
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M.A.	Mixed air
M.O.	Motor operated
MAN. DPR.	Manual damper
MAT.	Material
MAX.	Maximum
MBH	1,000 British thermal units/hour
MECH.	Mechanical
MET./MTL.	Metal
MEZZ.	Mezzanine
MFR.	Manufacturer
MH	Manhole
MIN.	Minimum
MISC.	Miscellaneous
MPS	Medium pressure steam
MS	Motor starter
MSS	Manufacturers Standardization Society
MTD./MT.	Mounted OR Mount
<hr/>	
N.I.C.	Not in contract
N.T.S.	Not to scale
N2	Nitrogen
N2O	Nitrous oxide
NAECA	National Appliance Energy Conservation Act
NB	National Board of Boiler and Pressure Vessel Inspectors
NCPI	National Clay Pipe Institute
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NO. OR #	Number
NOM.	Nominal
NSF	National Sanitation Foundation
<hr/>	
O.	Oxygen
O.A.	Outside air
O.D.	Outside diameter

O.I.	Oil interceptor
O.V.	Outlet velocity
O/C	On center
ODH	Ohio Department of Health
ODMH	Ohio Department of Mental Health
ODMR/DD	Ohio Department of Mental Retardation and Developmental Disabilities
ODOE	Ohio Department of Energy
ODOT	Ohio Department of Transportation
ODRC	Ohio Department of Rehabilitation and Correction
ODYS	Ohio Department of Youth Services
OPG.	Opening
OPP.	Opposite
OSHA	Occupational Safety and Health Administration
OU./OZ.	Ounce
<hr/>	
P.D.	Pressure drop
P.I.V.	Post indicator valve
P/L	Property line
PDI	Plumbing & Drainage Institute
PEI	Petroleum Equipment Institute
PLBG.	Plumbing
PNEU.	Pneumatic
PRESS.	Pressure
PROP.	Propeller
PRV	Pressure-reducing valve
PSF	Pounds per square foot
PSI	Pounds per square inch
PSIG	Pounds per square inch gauge
PT	Plaster trap
<hr/>	
R	Register
R.A.	Return air
R.D.	Roof drain
R/W	Right of way
RAD.	Radius OR Radiation OR Radiator
RECIRC.	Recirculating
REG.	Register
REINF.	Reinforced
REL.	Relief
REQ'D.	Required
RH	Right hand
RHC	Reheat coil
RM.	Room
RPM	Revolutions per minute
RTA/C	Rooftop air-conditioning unit
RW	Raw water
RWC	Rainwater conductor

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S & R	Supply and return
S	Sink
S. DPR.	Smoke damper
S.A.	Shock absorber
S.A.	Supply air
S.F.	Square feet
S.M., S/M	Sheet metal
S.P.	Static pressure
S.S.	Service sink
S.S.	Storm sewer
S.S., S/S	Stainless steel
SAN.	Sanitary sewer
SB	Shampoo bowl
SD	Shower drain
SD	Smoke detector
SECT.	Section
SHR.	Shower
SHT. MT'L.	Sheet metal
SHT.	Sheet
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPEC.	Specification
SQ.	Square
SQ.FT.	Square feet
ST	Sound trap
STAT	Thermostat
STD.	Standard
STL.	Steel
STM.	Storm
SUCT./S	Suction
SW	Softened water
SW.	Switch

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T.W.	Tempered water
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T'STAT	Thermostat
TD	Temperature difference
TEMP.	Temperature
THERM.	Thermometer OR Thermostat
TYP.	Typical

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UC	Undercut
UFC	Uniform Fire Code, International Fire Code Institute
UH	Unit heater
UL	Underwriters Laboratories, Inc.
UR	Urinal
UV	Unit ventilator

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V.	Vent
V.T.R.	Vent through roof
VAC.	Vacuum
VC	Vacuum cleaning
VCP	Vitrified clay pipe
VERT.	Vertical
VIB. ISO.	Vibration isolator
VSP	Vitrified sewer pipe

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W.	Width OR Water
W.G.	Water gauge
W/	With
W/O	Without
W/W	Wall to wall
WAT.	Water
WB	Wet bulb
WC	Water closet
WH	Wall hydrant OR Water heater
WO	Waste oil

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XFMR	Transformer
YD.	Yard
YH	Yard hydrant

END OF SECTION 260500

## SECTION 260505 - ELECTRICAL EXCAVATION AND BACKFILL

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Division 02, "Existing Conditions."
- B. Division 03, "Concrete," and Section OM 03 30 00, "Cast-in-Place Concrete."
- C. Section OM 26 05 00, "Common Work Results for Electrical," Part 3, "Cutting and Patching."

#### 1.03 DESCRIPTION

- A. The bedding and backfill requirements listed in this Section represent a minimum requirement. If Local or State requirements are in excess of listed requirements, such requirements shall supersede.
- B. ALL EXCAVATION AND BACKFILL WORK SHALL COMPLY WITH REQUIREMENTS OF THE LATEST STANDARDS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).
- C. Provide excavation and backfilling for Electrical Work. Backfill to finish grade or to levels suitable for finish grading and provide finish grading.
- D. Coordinate routing of underground lines with the A/E to minimize disruption and damage to trees, shrubs, walks, drives, and other landscape features.
- E. Excavation, backfill, surface repair, and traffic control within the public right-of-way shall be in accordance with governing agency rules and regulations. Pay any fee associated with alteration of the roadway.
- F. Remove unusable or surplus excavated material from the site. Deposit any usable excavated material where directed by the A/E.
- G. Locate and touch existing underground utilities, if any, in the areas of new Work. If utilities are to remain in place, provide adequate means of protection during earthwork operations. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, notify the A/E immediately for instructions before proceeding. Cooperate with Utility Companies and the Owner in keeping services and the facilities in operation.
- H. Excavation damage to, or interruption of service of, any underground utility shall be a liability of the Contractor, whether or not plotted on the Drawings. Promptly repair or replace all damage to any existing utility to the full satisfaction of the Utility Company, the Utility Owner, and the A/E.
- I. All existing utility service conduits, wiring, etc., which are uncovered, whether within or beyond the property lines, shall be suitably supported, protected, and maintained in operation, and shall be protected against settlement when excavations are refilled.
- J. Coordinate timing of excavations where required by Code Authority having Jurisdiction or where otherwise specified herein.
- K. Obtain approval from the A/E for bearing conditions.



- L. Contact the A/E to obtain copies of Soils reports, if available. Bidders are strongly urged to visit the site and investigate existing soil conditions themselves.
- M. (11) months after Contract Completion, review the excavated areas and add any backfill due to settling, etc. Re-seed or re-sod after confirming with owner..
- N. Contractor shall provide seed grass cover to reestablish landscape to existing conditions where disturbed by its Work. This includes replacement of existing plants, shrubs, and related items.
- O. Repair and restore plants, shrubs, trees, sodded areas, paving, streets, curbs, and walks to match existing in the area where excavations are made.
- P. Maintain seeded lawns not less than (11) months after Contract Completion and add any backfill due to settling, etc. If seeded in non-growing season and not given full (11) months of maintenance, or if not considered acceptable at that time, continue the following growing season until an acceptable lawn is established, as determined by the A/E.

#### 1.04 EXISTING SOIL CONDITIONS

- A. Refer to Soils Report.

#### 1.05 QUALITY ASSURANCE

- A. Standards:
  - 1. Ohio Department of Transportation (ODOT), Construction and Material Specifications
  - 2. State and Local requirements
  - 3. OSHA requirements
  - 4. American Concrete Institute (ACI).

#### 1.06 CONCRETE ENCASEMENT

- A. Provide a 3 in. minimum concrete envelope around underground conduits.
- B. All concrete shall be 5,000 PSI minimum and placed in accordance with applicable ACI Standards. Refer to Section 03 30 00.

### PART 2 PRODUCTS

#### 2.01 BACKFILL

- A. Typical backfill conditions:
  - 1. Where bedding is not specified or required by Code: Previously excavated material.
  - 2. Concrete pads and bases: Granular material conforming to Division 02 requirements.
- B. Materials:
  - 1. Crushed stone: (ODOT Item 304).
  - 2. Pea gravel: 1/8 in. minimum to 3/4 in. maximum diameter.
  - 3. Sand: Clean, dry, coarse or medium.
  - 4. Washed gravel: 3/4 in. size.
  - 5. Concrete encasement: Material conforming to Division 03 requirements.
- C. Materials Prohibited from Being Used for Backfill:
  - 1. Material containing large rocks (over 2 in.), building materials, masonry debris, cinders, rubbish, wood, or other material subject to decay.
  - 2. Any material which may cause damage to cabling, conduit, or duct banks.
  - 3. Frozen earth.

### PART 3 EXECUTION

#### 3.01 EXCAVATION

- A. Saw-cut existing street, drives, sidewalks, curbs, and parking lot paving, and other permanent hard surfaces that are encountered in the path of the excavation.
- B. Excavations shall be open-cut from the surface. No undercuts will be permitted, except where specifically directed by the A/E.
- C. Place no backfill until underground circuits have been tested. Compact backfill in 6 in. deep layers. Mark location of trenches, wiring, and conduit on Record Drawings.
- D. Hold trench width to a minimum.
- E. Do not excavate utility trenches parallel to building, or column footings, closer than 5 ft., except with prior written approval of the A/E. When parallel trenches deeper than the building footings are required, the horizontal distance from the footing shall be equal to, or greater than, 1-1/2 times the vertical distance below the footing, but in no case shall the horizontal distance be less than 5 ft., except with the written approval of the A/E.
- F. Burial of Electrical Conduit, Duct, or Conductors: Trenches shall be of sufficient depth, such that the top of the highest duct is not less than 24 in. below finished grade, or greater, if required by Code, specified elsewhere in these Specifications, or shown on the Drawings. Trench bottoms shall be sized to accommodate the conductors, conduit, or ductbank, and shall be at least 6 in. wide. Primary and secondary electrical service feeders and conduits shall have 36 in. minimum cover.
- G. Whenever the soil is found unsuitable for supporting feeders, conduit or conductors, provide proper foundation after receiving written approval of the A/E.
- H. Remove, from site, excess materials unsuitable for fill.
- I. Coordinate timing of excavations in advance with the A/E and the Owner.

#### 3.02 PROTECTION

- A. Maintain in place adequate barricades, guards, planking, plating, signage, warning lights, etc., at and around excavations.
- B. Contact the Ohio Utilities Protection Service (1-800-362-2764) well in advance of the start of any excavation to determine if any of the Utility Companies have underground utilities in, or near, the project area.
- C. Contact the Owner and the Local Water and Sewer Department, Gas Company, Electric Company, Telephone Company, etc., regarding the possibility of encountering existing utilities. Maintain the integrity of all existing utilities.
- D. Protect existing utilities encountered during excavation work in a manner acceptable to the Utility Owner. Contractor shall promptly repair or replace, at its expense, all damage to any existing utility to the full satisfaction of the Utility Company, the Utility Owner, and the A/E.
- E. Provide and maintain bracing, shoring, and sheet piling or sheathing sufficient to safely support walls of the excavation. Barricade and maintain in a safe condition until backfilling is completed.
- F. Provide and operate pumping equipment to keep excavation free of water at all times.
- G. Protect excavations from frost by covering and heating as necessary.

### 3.03 BACKFILLING

- A. Backfill only when exact locations of lines and equipment have been recorded, and all tests and inspections have been completed.
- B. Do not place fill material on frozen ground, or use fill in a frozen condition.
- C. Deposit fill in layers of thickness required by the nature of the soil, or as directed, but not exceeding 6 in. compacted thickness, to a point 24 in. above conduit, and 12 in. thickness above this point. Compact each layer to a uniform solid mass. Place fill in horizontal layers, beginning with lowest areas and building up until entire area to be filled is at a uniform elevation. Compaction shall be a minimum of 90 lbs. per cu. ft., laboratory dry weight.
- D. Control moisture content of compacted fill to ensure maximum density by adding water and working soil prior to compacting.
- E. Use machine tampers around perimeter of foundation walls or areas inaccessible to large equipment and rollers. Do not use rolling equipment in areas adjacent to foundations.
- F. Provide clay bulkheads, minimum 3 ft. long, across the trench at 100 ft. intervals to impede the natural movement of ground water. Top of bulkheads shall extend 6 in. above top of conduit.
- G. Where excavations have not been properly filled or where settlement occurs, refill, compact, smooth off, and finish excavations to a final condition acceptable to the Owner and A/E.

### 3.04 EXCAVATION SAFETY

- A. Contractor shall be solely responsible for construction means, methods, techniques, sequences, procedures, or safety precautions and programs in connection with this Work. The Owner, A/E, and A/E will not be responsible for the Contractor's failure to employ proper safety procedures.
- B. Excavation and trench wall supporting, shoring, sloping, cribbing, stepping of excavations, and other steps required for safety shall be in strict accordance with OSHA and Local Code requirements.
- C. Slope sides of excavations to comply with requirements of OSHA and Code Authority having Jurisdiction. Shore and brace where sloping is not possible because of space restrictions or instability of material exposed.
- D. Maintain sides and slope of all excavations in a safe condition, until completion of backfilling.
- E. Minimize time trenches are kept open. Fill as soon as possible.
- F. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
- G. Barricade open excavations occurring as part of this Work, and post with warning lights. Erect warning lights as required by OSHA and Code Authority having Jurisdiction. Consult with the A/E regarding additional requirements.
- H. Protect existing structures that are to remain, such as utilities, sidewalks, pavements, and other facilities, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- I. Refer to the "Manual of Accident Prevention in Construction," published by the Associated General Contractors of America, and to the safety regulations of the appropriate State Agency.

END OF SECTION 260505

## SECTION 260506 - ELECTRICAL SUBMITTALS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Transmittal form: Use State of Ohio Shop Drawing Transmittal form.
- B. Materials and equipment installed under the Electrical Contract shall meet all the requirements of the Contract Documents, and no materials or equipment shall be ordered or installed until submittals are reviewed and approved by the A/E.
- C. Refer to Division 33, "Utilities," Section OM 33 70 00.01, "Electrical Utilities," for additional electrical items that the Contractor shall submit.
- D. Submit complete copies of the catalog data or shop drawings for each manufactured item of equipment and all components to be used in the Work, including the following:
  - 1. Brand name.
  - 2. Catalog number.
  - 3. Specific performance data.
  - 4. Material description.
  - 5. Rating.
  - 6. Capacity.
  - 7. Dimensional data.
  - 8. Material gauge or thickness.
  - 9. Wiring diagrams.
- E. Catalog data for equipment reviewed by the A/E shall not take precedence over the requirements of the Contract Documents. Review by the A/E shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination.
- F. When submitted for review, all shop drawings shall bear the Contractor's signed certification of the following:
  - 1. Contractor has reviewed, checked, and approved the shop drawings.
  - 2. Shop drawings have been coordinated with the requirements of the Project and with the provisions of the Contract Documents.
  - 3. Contractor has verified all field measurements and construction criteria, materials, catalog numbers, and similar data.
- G. It is understood that the A/E's review is ONLY for conformance with the design concept of the project and with the Contract Documents, and further, that the A/E is not responsible for the means, methods, sequences, techniques, or procedures of construction, or for safety precautions and programs incidental thereto.

#### 1.03 SHOP DRAWINGS

- A. Indicate arrangement of component parts, physical dimensions, materials, electrical and mechanical service requirements, colors (where required), controls, accessories, capacities, and performance characteristics.

- B. Prior to submitting shop drawings, the Contractor shall stamp and sign its certification that the equipment shown on the submittals meets all the requirements of the Contract Documents. UNSIGNED COPIES WILL NOT BE REVIEWED.
- C. Submit (8) copies, unless otherwise noted. Approved shop drawings shall be distributed as follows:

QUANTITY	TO
1	A/E
2	Contractor
2	Supplier
3	Operating and Maintenance Manuals

1.04 CONTRACTOR RESPONSIBILITIES

- A. Completely review Shop Drawings, product data, and samples prior to submission.
- B. Determine and verify the following:
  - 1. Field measurements.
  - 2. Field construction criteria.
  - 3. Catalog numbers and similar data.
  - 4. Conformance with Specifications.
  - 5. Quantities and sizes.
- C. Coordinate each submittal with requirements of the Work and the Contract Documents.
- D. Notify the A/E, in writing, at time of submission, of any deviations in the submittals from the requirements of the Contract Documents.
- E. Contractor shall make submittals promptly in accordance with the approved schedule, and in such sequence as to cause no delay either in its Work.
- F. Immediately make any corrections or changes in rejected submittals as required by the A/E and resubmit until accepted.
- G. If the Contractor orders equipment or materials, or begins installation, fabrication, or work prior to return of approved submittals, it shall be “at the Contractor’s own risk.”
- H. When (2) or more items of the same material or equipment are required, they shall be of the same Manufacturer.
- I. Incorporate shop drawings into the Operating and Maintenance Manuals.

1.05 CERTIFICATIONS

- A. Provide:
  - 1. Test Agency results verifying capacities, operating conditions, and power requirements at design conditions.
  - 2. Manufacturer’s statement of compliance with Standards discussed in individual Specification Sections.
  - 3. Equipment labels indicating Certification requirements.
  - 4. Quality standard designations on each unit piece, e.g., each device, fixture, or component.
  - 5. Typed verification that noted testing procedures were complied with.
  - 6. Other Certifications listed in other Sections of the Specifications.

1.06 REQUIRED SUBMITTAL INFORMATION

- A. The items listed below may not be a complete list of required submittals. Submit for approval all items to be provided, whether listed or not.

KEY FOR REQUIRED SUBMITTALS

- A Catalog Cuts/Shop Drawings (8 copies).
- B Operating and Maintenance Manuals.
- C Color samples (3 each).
- D Product samples (2 each).
- E Typed statement of material to be furnished.
- F Typed verification of compliance with certification requirements.
- G Test.

(Submit number of copies indicated. If not indicated, submit full quantity of copies previously listed.)

ELECTRICAL SUBMITTALS REQUIRED

KEY

Generator .....	A, G
Automatic Transfer Switch.....	A, G
Switchboard .....	A
Panelboards.....	A
Wiring Devices and Plates.....	A
Cable Tray .....	A
Lighting Fixtures and Lamps.....	A, G
Flexible Wiring System .....	A
Contactors.....	A
Motor Starters .....	A
Disconnect Switches.....	A
Fuses and Spare Fuse Cabinet .....	A
Lighting Control System.....	A, G
Programmable Time Clock.....	A, G
Telephone/Data System .....	A
Intercom System .....	A, G
Paging System .....	A, G
Fire Alarm System Components.....	A, G
Fire Alarm System Wiring Diagram.....	A
Carbon Monoxide Detection System.....	A, G
Electric Wall Heater.....	A
Transient Voltage Surge Suppressors (TVSS).....	A
Lightning Surge Suppressors .....	A
Lamp Changer .....	A
Photocell.....	A, G
Site Pull Boxes.....	A
Operating and Maintenance Manuals (See Section 26 05 07).....	B-3

END OF SECTION 260506



## SECTION 260507 - ELECTRICAL OPERATING AND MAINTENANCE MANUALS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section OM 26 05 60, "Requirements for Completion of Electrical Work."

#### 1.03 DESCRIPTION

- A. Compile Operating and Maintenance Manual upon completion of the Work for final acceptance. Submit draft of Operating and Maintenance Manual to the A/E for review and approval before Contract Completion.
- B. Submit final corrected Operating and Maintenance Manual (7) days before Contract Completion.
- C. Upon approval, provide (3) Operating and Maintenance Manuals.

### PART 2 PRODUCTS

#### 2.01 OPERATING AND MAINTENANCE MANUALS

- A. The following items, together with any other pertinent data, shall be included in each Operating and Maintenance Manual. This list is not necessarily complete and shall be used only as a guide. Format of manual to be as follows:
  - 1. Operating and Maintenance Manuals shall be loose-leaf, 3-ring, hardcover binders, no larger than 11 in. wide x 12 in. high. Material shall be typewritten or printed, and be fully legible. Each section shall be divided by labeled tabs.
  - 2. Cover:
    - a. Title of Project.
    - b. Date of Project completion.
    - c. Name and address of the Owner.
    - d. Date of submittal.
    - e. Name and address of the Contractor.
    - f. Name and address of the A/E.
  - 3. Second Page: Index.
  - 4. First Section: A copy of each shop drawing and approval submittal with an index at the beginning of the section.
  - 5. Second Section:
    - a. A list of all equipment used on the job.
    - b. Parts list with numbers of replaceable items, including sources of supply.
    - c. Manufacturers' and nearest Factory Representatives' names and addresses.
    - d. Model and Serial numbers of components of systems installed.
    - e. Routine and 24-hour emergency service/repair information:
      - 1) Name, address, and telephone number of servicing agency.
      - 2) Names of personnel to be contacted for service arrangements.
  - 6. Third Section:
    - a. Description of systems.



- b. Manufacturer's literature describing each piece of equipment, including the following:
  - 1) Operating and maintenance instructions.
  - 2) Start-up and shutdown procedures.
  - 3) Routine and emergency servicing instructions.
- c. List of fuses used and of lamps used.
- d. Underwriters Laboratories, Inc. (UL), inspection plate.
- e. Copies of all panel directories.
- f. Copies of all testing reports.
- g. Prints of all system wiring and control diagrams.
- h. All certifications and related information.
- i. Copies of all written warranties.
- j. The Owner's receipt of spare parts. Refer to Section 26 05 60.
- k. Copy of the signed and dated letter from the Owner, stating satisfactory completion of instruction, listing names of personnel instructed, and listing names of persons giving the instruction.

### PART 3 EXECUTION

#### 3.01 CONTROL DIAGRAM

- A. Mount approved copy in a neat frame with backing under glass, or within a plastic jacket, in the Mechanical Room or other area designated by the A/E or Owner.

END OF SECTION 260507

SECTION 260508 - TEMPORARY LIGHTING AND POWER

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section OM 01 50 00, "Temporary Facilities and Controls."

1.03 DESCRIPTION

- A. Codes: Comply with the provisions of the following:
  - 1. National Electrical Safety Code (National Bureau of Standards).
  - 2. Safety and Health Regulations for Construction of the Department of Labor Bureau of Standards.
  - 3. Applicable Local Electrical and Building Codes.
- B. Service Connection: Obtain the temporary power service immediately after awarding of Contract, unless such temporary power service is definitely not needed until a later date.
- C. Connect and Disconnect Charges: Contractor shall include in its Bid, all charges by the Power Company for the temporary service connection and disconnection.
- D. Energy Consumption: Contractor shall also include in its Bid the cost of temporary service and electrical energy used during construction.
- E. These changes are to be included in the electrical allowance. Refer to Section OM 01 21 00, "Allowances."

1.04 GROUNDING

- A. System Ground: Ground power service and distribution system properly. Whenever a system neutral point is established, install neutral grounding.
- B. Equipment Ground: Provide a ground wire capable of equipment grounding with all feeders and branch circuits not installed in metallic raceways.

1.05 POWER AND DISTRIBUTION SYSTEM

- A. Installation shall comply with 2008 National Electrical Code.
- B. Determine and provide the voltage and size of electrical service that will be required for construction by all Trades during the construction period.
- C. Make arrangements with the Power Company, and provide and maintain temporary power at 240/120 volt or 208/120 volt for lighting and power required during construction. Ampacity shall be sufficient to supply the electrical demand load imposed during construction. Provide 200 amp. minimum service.
- D. Maintain the temporary power system and remove it as construction progresses.
- E. The temporary power system shall comply with 2005 NEC Article 527.
- F. Balance loads connected to 3-phase service.
- G. All panel feeders shall be installed in conduit. "BX" will not be permitted.

- H. All branch wiring shall be protected from accidental damage. Flexible cables and extension cords shall be extra-hard-usage Type SO.
- I. Equipment and Devices:
  - 1. Distribution method, lighting fixtures, and wiring devices used for temporary lighting and power need not be new.
  - 2. All step-down transformers used within the building shall be dry-type construction.
  - 3. Use #12 wire for branch circuits shorter than 100 ft. to the last receptacle or outlet, and #10 wire for circuits longer than 100 ft.
- J. Provide temporary lighting ((1) 100 watt incandescent fixture per 100 sq. ft.), disconnects, and receptacles; arrange for service; and pay for all necessary permits.
  - 1. Temporary lighting: Provide fixtures suitable for the environment and sufficient to provide an average maintained illumination of 15 foot-candles, minimum.
  - 2. Temporary receptacles: Provide an average of (2) receptacles per 400 sq. ft. of construction area. Connect no more than (4) receptacles to (1) 20 amp. circuit. All receptacles shall be GFI type.
- K. Grounding: All lighting receptacles and power circuits shall have a continuous ground. Integrity of all ground systems shall be checked at least every (3) months or whenever there is evidence of physical damage.
- L. Safety: Eliminate all tripping hazards and post signs regarding specific hazards that are presented by the temporary wiring system.

END OF SECTION 260508

## SECTION 260510 - ELECTRICAL TESTS, ADJUSTMENTS, AND INSPECTIONS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 SCOPE

- A. Conduct such tests and adjustments of equipment as required by the A/E or as necessary to verify performance requirements. Submit data taken during such tests to the A/E. Pay all professional engineering fees involved in required testing of equipment.
- B. Perform a megger test at 1,000 volts on all 600 volt insulation rated power conductors.
- C. Certified Representative of Equipment Supplier shall check out and test all special systems and submit a report to the A/E indicating results of such final checkout and test.
- D. Upon completion of electrical work, test the full load phase balance of the entire electrical system. Tests shall be witnessed by the A/E's Representative, and these results shall be recorded and reported to the A/E in writing.
- E. Optimum phase balance under full load condition shall be obtained by reconnection of panelboard branch circuits. Any panelboard requiring circuit changes for load balance shall have properly revised changes made in its panel directory.
- F. Verify proper rotation of motors during load balance and final adjustments.
- G. Test lines before burying or covering with new construction.
- H. Tests shall include:
  - 1. Proper operation of lights and equipment.
  - 2. Continuity of conduit system.
  - 3. Insulation leakage and impedances.
  - 4. Ground system resistance.
  - 5. Any Special System tests described in other Sections of these Specifications.
- I. Demonstrate to the Owner that all electrical systems are operating properly. Make available to the Owner, upon request, the following information:
  - 1. Feeder and branch wiring megger tests.
  - 2. Grounding resistance measurements.
  - 3. Load balance.
  - 4. Special System tests.

#### 1.03 TESTS AND INSPECTION

- A. The Contract Documents, Laws, Ordinances, Rules, Regulations, or Orders of any Code Authority having Jurisdiction may require portions of the Work to be inspected, tested, or approved.
- B. Arrange for inspection of the Work by the Code Authority having Jurisdiction. Inspections shall be conducted by the following:
  - 1. State of Ohio Department of Commerce, Division of Industrial Compliance, Construction Compliance Section.
  - 2. State of Ohio Department of Commerce, State Fire Marshal Division.

- C. The A/E shall be notified of all scheduled tests and adjustments at least (48) hours before they are scheduled, so that it may witness same. If the Contractor performs any test or adjustment without the A/E present, or without proper notification, it shall perform the test or adjustment a second time, in the presence of the A/E. All test schedules shall be coordinated with the Owner to minimize inconvenience.
- D. Contractor shall bear all costs of such inspections, tests, or approvals.
- E. Secure required certificates of inspection, testing, or approval and include them in the Operating and Maintenance manuals.
- F. Should any of the Work be covered up or enclosed prior to completion of all required inspections and approvals, uncover the Work and, after it has been completely inspected and approved, make all repairs and replacements with such materials and workmanship as are necessary to secure the approval of the A/E, and at no additional cost to the Owner.
- G. Furnish all test gauges, meters, equipment, and personnel required, and test as necessary, to demonstrate the integrity of the finished installation to the approval of the Code Authority having Jurisdiction and the A/E.
- H. Check each piece of equipment for defects and shall verify that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

#### 1.04 ENERGIZATION OF POWER TO EQUIPMENT ITEMS

- A. Coordinate application of power to all equipment.
- B. Power may be applied briefly to check direction of motor rotation; however, the equipment item shall NOT be powered up without the presence of the Contractor.

#### 1.05 FINAL OPERATING TESTS AND PROCEDURES

- A. Prior to Contract completion, conduct system operational tests for a period of at least (5) days, not necessarily consecutive, as scheduled by the Owner, to demonstrate fulfillment of the requirements of the Contract. During this time, adjust equipment so that it will perform as the Manufacturer intended and so that systems will function as designed.
- B. Each system shall be operated in every mode of operation, and the position of switches and other devices shall be checked for proper closure, operation, and switching.
- C. Test emergency power and lighting systems by simulating loss of power.
- D. Check polarity of all receptacles.
- E. Test operation of all GFI breakers and receptacles.
- F. Test all lighting control systems.
- G. Test operation of exterior lighting system. Program time clock as directed by the Owner.
- H. Check motors for proper rotation and operating temperature.
- I. Check breakers and switches for proper operation.
- J. Replace all inoperative lamps and ballasts. Replace noisy ballasts.
- K. Remove panel covers and clean inside of all panels. Provide typewritten circuit directory.
- L. Check and verify that overcurrent protection is adequate for each load being served.

### 1.06 FOLLOW-UP INSPECTIONS

- A. Make an inspection within (90) days after occupancy of the building to make minor adjustments as needed to ensure that all equipment is operating properly. Schedule with the A/E.
- B. A minimum of (1) month before the end of the guarantee period, contact the Owner and A/E to discuss system operation, and to plan for the future care and maintenance of the system.
- C. (1) month before the end of the guarantee period, contact the Owner and perform an inspection to review any items needing correction.
- D. (1) month before the end of the guarantee period, review the excavated areas and add any backfill due to settling, etc. Re-seed or re-sod after confirming with owner.
- E. Complete the punch-list and send back a copy to the A/E, with each item initialed, when completed. Refer to Article 10 of the General Conditions.

### 1.07 CERTIFICATE

- A. Furnish approved Certificate of Final Inspection.

## PART 2 PRODUCTS (NOT APPLICABLE)

## PART 3 EXECUTION

### 3.01 MOTOR TESTS

- A. After each motor load of 15 HP or greater has been activated and operated at least once through its intended duties, the electrical circuits shall be nondestructively tested from either the load side of the disconnect switch or the secondary side of the overcurrent device. Testing shall be done to establish the present operating parameters for the following:
  - 1. Resistance imbalance (hot spots) with results expected to be less than 0.05 ohms in each phase.
  - 2. Total inductance imbalance with results expected to be less than 25% from a phase-to-phase analysis on the system and 1% on the motor.
  - 3. Leaks to ground with results expected to be greater than 20 megohms in each phase.
  - 4. Report on any visual findings of significance.
  - 5. 3-phase dynamic testing of motors in operation. Record each phase voltage balance and current flows when motor is operating at recommended load.
  - 6. Capacitance imbalance when capacitors are part of the installation.
- B. Details of Test: For each motor, perform the following measurements:
  - 1. Voltage: Phase 1-2, phase 2-3, and phase 3-1.
  - 2. Voltage unbalanced percentage:
    - a. Phase 1-2, phase 2-3, and phase 3-1.
    - b. Overall voltage unbalanced status.
    - c. Current, current percentage of full load amps, and current status.
    - d. HP, KW, efficiency, and power factor.
  - 3. Provide recommendations as to what should be done on each condition that was tested and found to be less than desirable. Record where in the circuit each test is being performed.

### 3.02 MOTOR TESTING ACCURACY

- A. The accuracy of each test shall be within the following range:
  - 1. Voltage:  $\pm 1.0\%$  volt.
  - 2. Full load amps:  $\pm 1\%$ .

3. HP, KW, and power factor:  $\pm 1\%$ .
4. Efficiency:  $\pm 5\%$ .

3.03 MOTOR POST-TESTING WORK

- A. The Contractor shall leave all installed equipment in the original state and condition found at the beginning of the job except where repairs are made.

END OF SECTION 260510

SECTION 260511 - EQUIPMENT HOOK-UP AND FINAL CONNECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Coordinate the electrical requirements of equipment with the Supplying Contractor or Manufacturer.
- B. Provide plug-in or rough-in and final connection for each piece of equipment requiring power, including, but not limited to, the following:
  - 1. Electric cord reels.
  - 2. Overhead doors.

END OF SECTION 260511





## SECTION 260515 - ELECTRICAL SLEEVES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. In Drywall, Masonry, or Concrete Wall Construction:
  - 1. Furnish sleeves for conduit, telephone, data, paging, and control wiring, and other electrical items.
  - 2. Option for above ceiling only: Contractor shall omit block(s) where required for penetrations, and shall provide square-finished opening. Do not omit blocks under bearing points or in fire-rated or smoke-rated walls.
  - 3. Coordinate with the A/E and Structural Engineer.
  - 4. Contractor shall provide openings through metal building walls and seal watertight.
- B. In precast concrete work, in lieu of sleeves, cut holes after erection of concrete.
- C. Sleeve where electrical work passes exposed through walls, and where any electrical work passes through smoke-rated or fire-rated separations, equipment room walls, or above-grade floors.
- D. Verify which walls, ceilings, or floors are fire-rated, if any, and provide approved fire-blocking or fire-protective devices.
- E. Provide dimensions and locations of openings required in walls for sleeves and similar items.
- F. Carefully coordinate and check locations of sleeves immediately before and after each concrete pour and masonry installation.
- G. Correctly locate and size sleeves.
- H. If sleeves are not installed in construction, due to fault of the Contractor, holes through masonry or concrete construction shall be core drilled by the Contractor.
- I. Sleeves are not required in floor slabs on grade or in core-drilled openings not requiring waterproofing or fire suppression. Exception: Sleeves are required at core drilling through hollow core pre-cast slabs and through concrete block walls, to facilitate containment of required fire-stopping material.
- J. Sleeving with absolutely watertight seal is required for electrical work passing through exterior walls above grade, and underground foundation walls and other below-grade penetrations into building.

### PART 2 PRODUCTS

#### 2.01 STANDARD SLEEVES

- A. Sleeve material, up to 8 in. diameter: Machine-cut Schedule 40 black steel pipe.
- B. Sizing: Sleeves shall be large enough for insulation to be continuous, or for watertight or fire-rated sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

## 2.02 WATERTIGHT SLEEVE SEALS

- A. Oakum Caulking: Thiokol Corp. With lead-pour or elastomeric sealant. Elastomeric sealant shall be 2-component, polysulfide or polyurethane.
  - 1. Other Acceptable Manufacturers: Approved equal by 3M, Calpico, or Hilti.
- B. (Option) Compression Seals: Thunderline Corp. Linkseal. Stainless steel bolts and nuts. Provide correct size seal, and coordinate with sleeve size.
  - 1. Other Acceptable Manufacturers: Approved equal by Wayne, Michigan, or Calpico.
- C. Provide sleeves with waterstop anchor flange at midpoint where penetrating structure at or below grade.
  - 1. Acceptable Manufacturers: Calpico, 3M, or Hilti.

## 2.03 FIRE-RATED SLEEVE SEALS

- A. ASTM E119 and E814 Silicone RTV foam, UL-approved.
- B. Acceptable Manufacturers: Dow Corning 3-654B, Chase Foam, 3M Fire Barrier caulking or putty, IPC Flamesafe, Carborundum Fibersil, Nelson Fire Stop, Standard Oil Co. Fyre Putty, Johns-Manville Cerafiber, KBS Mortar Seal, Hilti Fire Stop, International Protective Coatings Corporation "Flame-Safe," or CSD Sealing Systems "FSP."
- C. The sealant shall be red so they can be easily inspected by building personnel.

## PART 3 EXECUTION

### 3.01 COORDINATION

- A. Coordinate location of sleeves, core drilled holes, and other holes required with equipment and Structural Engineer.

### 3.02 CUTTING

- A. Cut off sleeves through walls flush with each surface.
- B. Cut off sleeves 1/8 in. above finished floors and 3 in. above floors in kitchens, utility rooms, equipment rooms, and shafts. Bottom of sleeve shall be cut off flush with surface.

### 3.03 INSTALLATION

- A. BEFORE CONSTRUCTION OF MASONRY OR CONCRETE WALLS IS STARTED, locate and size of all openings required for the installation of equipment or sleeves. If it becomes necessary to cut into work because of the failure of the Contractor to coordinate then the Contractor shall perform the work, at its expense.
- B. Sleeves shall be installed plumb and true to line, grade, and position.
- C. Fire Blocking of Penetrations of Fire-Rated Construction:
  - 1. Use approved, UL-listed, fire-retardant sealants, backing, and packing to maintain fire rating of the structure penetrated.
  - 2. Spray UL-listed foam sealant around exposed conduits entering and leaving fire-rated wall or floor structures.
  - 3. To ensure fire blocking, close space around conduits and other electrical items passing through walls and floors. Seal space up to a 1/2 in. gap with sealant or caulking. Close off space greater than a 1/2 in. gap with sheet metal and seal airtight.
  - 4. For larger openings, provide UL-listed, FM-approved KBS sealbags as manufactured by International Protective Coatings Corporation.

5. Pack all fire-rated or sound-rated separation sleeves with glass fiber, high-temperature mineral wool, aluminum-silica fiber, fire-retardant rope, calcium silicate, or other noncombustible material to maintain fire rating of structure, and finish with fire-rated sleeve seals.
  6. Fill space around all sleeves extending into exposed areas with material compatible with adjacent construction and finish.
  7. All openings shall have been tested by Underwriters Laboratories utilizing the proper rated penetrations to be equal to, or greater than, the barrier assembly in which the penetration occurs.
  8. All penetrations and openings shall be installed in accordance with the Manufacturers' instructions.
  9. The fire-blocking assembly shall maintain the required fire-resistance rating of the wall or floor in which it is placed, and a further sealant shall be applied, if necessary, to attain a smoke-tight condition. Openings without sleeves shall be closed in the same manner.
- D. Unused sleeves shall be plugged, fire-packed, and finished to match adjacent surface.

END OF SECTION 260515



## SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section OM 26 05 10, "Electrical Tests, Adjustments, and Inspections."
- B. Section OM 26 05 33, "Raceways and Boxes for Electrical Systems."
- C. Section OM 33 70 00.01, "Electrical Utility (Site)."

#### 1.03 DESCRIPTION

- A. Provide conductors and cable for secondary feeder and branch circuit wiring, special system wiring, and control wiring.
- B. All feeder and branch circuit conductor sizes indicated on the Drawings shall have an ampacity equal to that listed in Table 310.16 of the National Electrical Code for copper conductors.
- C. Unless otherwise noted, all conductors shall be enclosed in a continuous, grounded raceway system.

#### 1.04 QUALITY ASSURANCE

- A. Standard: Underwriters Laboratories, Inc., (UL) Label.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Service Wire, Cerrowire, Southwire, Aetna, AIW, *Encore* or Essex/Superior.

#### 1.06 MINIMUM SIZE

- A. #12 AWG Cu.

### PART 2 PRODUCTS

#### 2.01 CONDUCTORS

- A. All line voltage (120 volts and higher) conductors shall be stranded copper, 600 volt insulation, Type THWN or XHHW 75 deg. C., and color-coded as indicated below.
- B. Type THHN 90 deg. C. conductors shall be used for all ballasted lighting fixtures.
- C. Motor conductors supplied from a variable speed drive shall have XLP insulation rated 1,000 volts (minimum), and shall be suitable for the pulse output signals generated by IGBT devices.

#### 2.02 FLEXIBLE WIRING SYSTEM

- A. Contractor has option to use a UL-listed, flexible wiring system in lieu of conduit for lighting circuits only.
- B. Acceptable Manufacturers: Lithonia "Reloc" or approved equal by America Cable Systems, Metalux/Cooper, Hubbell, *Encore* or Walkerflex.

2.03 SPECIAL SYSTEM WIRING

- A. All wiring shall be as specified above, unless specifically indicated otherwise. Refer to respective applicable Special System Sections for description of required wire or cable.

2.04 PLUG CONNECTED CABLE

- A. Flexible cord for short connection to equipment shall be 600 volt, heat-resistant, rubber insulated portable cable with neoprene jacket, UL Type "ST" on "SRDT." Cord shall be extra-flexible stranded copper with ground conductor. Provide termination plug.
- B. Flexible cable is NOT permitted for motor connections.

2.05 SPLICES

- A. Splices in conductors #10 AWG and smaller wire shall be made with Minnesota Mining and Manufacturing Company insulated "Scotch Locks," Ideal Company "Wing-nut," or Thomas & Betts Type "PT" connectors, or with mechanically crimped sleeves as manufactured by Thomas & Betts or Ideal Company, which shall be insulated with pressure-sensitive electrical tape equal to Minnesota Mining and Manufacturing Company "Scotch 33+."
- B. Splices in conductors #8 AWG and larger shall be made with pressure type mechanical connectors and insulated with (2) layers of insulating putty and (2) layers of "Scotch 88" tape.

PART 3 EXECUTION

3.01 WIRING INSTALLATION

- A. Unless noted otherwise, all conductors, including other special systems, shall be installed in conduit.
- B. Increase branch circuit wiring shown on the Drawing by (1) size for homeruns more than 100 ft. long and increase wire by an additional (1) size every 100 ft. thereafter.
- C. Multiple homeruns shall be permitted in any conduit run, however, a full size neutral shall be provided for each homerun. All multiple wiring installations shall be derated in accordance with 2005 NEC Table 310.16, or larger conductors shall be installed. Provide a neutral conductor for each circuit; NO NEUTRAL SHARING WILL BE PERMITTED.
- D. Free ends and loops at boxes and enclosures shall be pushed back in box and protected by blank covers or other means until the interior painting and decorating work is completed. Swab all conduits clean and dry before pulling wire. Wires #8 AWG and smaller shall be hand pulled. Use only UL-listed pulling lubricants, such as Ideal Company "WireLube" or "Yellow 77." Refer to Section 26 05 10 for testing of conductors.
- E. Leave at least 6 in. of free conductor at all outlets, except where conductors are intended to loop without splices through outlets for fixtures or wiring devices.
- F. The following wire color code shall be used as applicable to this Project:

WIRE	120/208 VOLT
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

Emergency: Same as above, but with 1/2 in. red tape wrapped twice around maximum 12 in. intervals at access points.

- G. Test and permanently tag each conductor wire, except neutrals, in panelboard gutter, by circuit number, before connecting to panelboard. Use Thomas & Betts "WM" adhesive tapes wrapped around the wire and formed into a flag.
- H. Use deoxidant cleaner on all wiring connections.
- I. Tag and identify all conductors entering or leaving terminal wiring strips.
- J. Motor control, low voltage, and line voltage conductors shall each be installed in separate conduits.
- K. The following special system conductors shall be installed in separate conduits:
  - 1. Telephone.
  - 2. Data.
  - 3. Emergency power.
  - 4. Fire alarm.
  - 5. Intercom.
  - 6. Public address.
  - 7. Control wiring.
- L. Low voltage wiring may not be run exposed, unless in cable tray.
- M. Only low voltage wiring for telephone and data transmission shall be run in cable tray.
- N. All wiring and cables installed in air handling plenums either shall be UL 910-listed, Teflon-coated, with plenum rated ties, or shall be run entirely in conduit.
- O. Wiring installation shall be acceptable to the Code Authority having Jurisdiction.

END OF SECTION 260519





## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Provide a grounding system including the following items:
  - 1. Driven ground rods.
  - 2. Metal water service pipe.
  - 3. Metal frame of building.
  - 4. Foundation rebar.
  - 5. Interior gas piping.
- B. Bond all of the above items together.
- C. Ground the padmount transformer, generator, secondary electrical distribution systems, including telephone board and all equipment, raceways, receptacles, motors, site lighting, exposed metallic projections, and special systems.
- D. Ground metering equipment and base in accordance with the requirements of the Power Company.
- E. Bond all metal columns, framing, and siding to driven ground rod system.
- F. Bond every other steel column around building perimeter to driven ground rod system.

#### 1.03 QUALITY ASSURANCE

- A. Standard: 2008 National Electrical Code (NEC) Article 250.

#### 1.04 GROUNDING ELECTRODES

- A. For Building Electrical Service:
  - 1. 5/8 in. diameter x 10 ft. long copper-clad steel ground rod at location indicated on the Drawings. Provide parallel ground rods to achieve a ground impedance less than 5 ohms.
  - 2. Per NEC 250-52 (A) (3), provide a base copper conductor (#4 minimum), or connect to foundation rebar (20 ft. long minimum). Extend grounding conductor to main service equipment and bond to ground bus.
- B. For the following, use 5/8 in. diameter x 10 ft. long copper-clad steel ground rods:
  - 1. Electrical service for Main Building and outbuildings as shown on the Site Plan.
  - 2. Pole-mounted lights.
  - 3. Ground bus bars.
  - 4. Fuel island canopy.
  - 5. Radio antenna mast.
  - 6. Building steel.
  - 7. Metal siding.
- C. All connections to steel shall be ERICO "Cadweld," Burndy "Thermoweld," or Harger "Ultraweld."
- D. All connections to aluminum shall be mechanical.

- E. Exothermic connections to columns shall be made on the web of the column.

#### 1.05 GROUNDING CONNECTORS

- A. All grounding connections in Main Service equipment and buried grounding electrodes shall be ERICO "Cadweld," Burndy "Thermoweld," or Harger "Ultraweld."
- B. Run main service grounding conductors in rigid nonmetallic conduit.
- C. Conduits entering a switchboard, panelboard, or similar enclosure through concrete, or requiring a ground bond, shall be bonded with the use of O-Z Gedney Type "BLG" bonding bushings and the same size conductor as the equipment grounding conductor.
- D. All other connections to pipes or conduits shall be made by the use of one of the following clamps:
  - 1. Burndy "GAR" Type.
  - 2. Penn-Union "GPL" Type.
  - 3. O-Z Gedney "ABG" or "CG" Type.
  - 4. Anderson GC-111 Type.

#### 1.06 CONDUIT AND RACEWAY SYSTEM GROUNDING

- A. The entire metallic conduit system shall be electrically continuous with locknuts cutting through paint on enclosures. Where reducing washers are used and where concentric or eccentric knockouts are not completely removed, bonding bushings shall be required.

#### 1.07 EQUIPMENT GROUNDING CONDUCTOR

- A. An equipment grounding conductor (green ground wire) shall be included with all circuit conductors over 100 volts. Size in accordance with 2008 NEC Table 250.122, except not smaller than #12 AWG for power and lighting circuits and #14 AWG for control circuits.

#### 1.08 NEUTRAL CONNECTION

- A. The neutral of the service entrance conductors shall be bonded to the switchboard enclosure by a main bonding jumper.

#### 1.09 WIRED GROUND CONNECTIONS

- A. Because the conduit system can provide a lower impedance path than the wired equipment grounding system, the wired equipment grounding system shall connect to the metallic conduit ground system in EVERY accessible panel, junction box, pullbox, fixture housing, motor terminal box, and other metallic enclosures, as follows:
  - 1. Panelboards shall have a ground assembly that has the same number, size, and type of anti-turn solderless lugs that the neutral assembly has. This grounding assembly shall be factory-bonded to the panel tub and shall have the screwdriver slots facing the front of the panel.
  - 2. Junction and pullboxes shall be bonded by the use of grounding screws or lugs listed by Underwriters Laboratories, Inc. (UL). If there are more than (4) ground wires entering a box, a ground assembly of the same type used for panelboards shall be bonded securely to the enclosure. Note that NEC requires that an equipment grounding conductor passing through any accessible location be bonded to that enclosure. Self-tapping sheet-metal screws are not permitted.
  - 3. In enclosures not requiring a ground assembly, all ground conductors entering an enclosure shall be connected together and a pigtail the size of the largest conductor shall be bonded to the enclosure with an attachment used for no other purpose.
  - 4. General-use outlet boxes shall be bonded by the use of a ground screw in the threaded ground tap.

5. Motor terminal boxes shall be grounded by the use of a ground lug supplied by the Manufacturer or by drilling and tapping a hole for a ground screw. Remove paint prior to making the connection.
6. Lighting fixtures shall be grounded by the use of a pigtail fastened on bare metal that is free of paint.
7. Use equipment grounding conductors on all convenience outlets. Outlet box attachment screws shall not be used as a ground.
8. In any enclosure that has a grounding assembly, all ground wires shall be connected to the assembly. Provide connection lugs or terminals for the ultimate number of wires to be connected to the assembly. Use a separate connection for each wire.
9. Paint and any other foreign material shall be removed from ground connections so that the connection is metal-to-metal.

1.10 GAS LINE

- A. Metallic natural gas piping within the building and above grade shall be bonded to ground system.

1.11 TELEPHONE SERVICE

- A. Ground telephone service equipment as shown and as required by the Telephone Utility Company.

END OF SECTION 270526



## SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section OM 26 05 19, "Low-Voltage Electrical Power Conductors and Cables."
- B. Section OM 26 27 26, "Wiring Devices."

#### 1.03 DESCRIPTION

- A. Provide boxes for devices, lighting fixtures, motors and equipment connections, system equipment connections, and special outlets. Provide pullboxes where more than (2) 90 deg. bends are required or if conductors are pulled further than 100 ft.
- B. Unless otherwise noted, all conductors shall be enclosed in a continuous, grounded, steel conduit or raceway.
- C. The conduit system shall be made mechanically tight and electrically continuous throughout. Conduit system shall be grounded at the service entrance.
- D. Use galvanized steel conduit. Exception: Conduit exposed outside shall be rigid aluminum. No aluminum conduit is permitted inside or encased in concrete.
- E. Schedule 40 PVC and coilable Schedule 80 HDPE conduit is permitted underground with limitations or, under certain conditions, below slabs.
- F. Minimum Size: 1/2 in. for control and low voltage wiring only; 3/4 in. for line voltage wiring; 1 in. minimum below slab or underground, except as otherwise indicated.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. Underwriters Laboratories, Inc., (UL) Label.
  - 2. American National Standards Institute (ANSI) C80 Specification.
  - 3. National Electrical Manufacturers Association (NEMA).
  - 4. 2008 National Electrical Code (NEC).

### PART 2 PRODUCTS

#### 2.01 BOXES

- A. All outlet boxes shall be galvanized pressed steel of standard knockout type. Covers shall be secured with pin-torx screws.
- B. Lighting outlet boxes shall be standard 4 in. octagonal, 1-1/2 in. minimum deep boxes with 3/8 in. fixture-mounting stud. Outlet boxes having more than (2) conduits, or when 3/4 in. conduit is used, shall be standard 4 in. square boxes 1-1/2 in. deep or deeper as might be required to accommodate the wiring contained therein.

- C. Flush device boxes in masonry walls shall be masonry boxes designed for the purpose, or 4 in. square boxes with raised covers designed for masonry.
- D. Wiring device boxes for surface conduit work and those located in potentially damp areas shall be FS Series cast boxes. Exterior exposed boxes shall be weatherproof or airtight with gaskets.
- E. Where outlet boxes are cast in concrete slabs, they shall be designed for concrete installation.
- F. Flush device boxes in plaster or drywall construction shall be 4 in. square, 2-1/8 in. deep boxes or gangable 2-1/2 in. deep boxes. Shallow 1-1/2 in. deep gangable boxes may be used only in demountable partitions and in other walls too thin for standard depth boxes.
- G. Boxes shall be large enough to accommodate the size and number of conduits secured thereto and the size and number of wiring conductors.
- H. All fittings, covers, and hardware shall be galvanized steel.
- I. Furnish narrow boxes for mounting switches in door frames/mullions.
- J. Boxes shall be NEMA type approved for the prevailing environmental conditions.
- K. Acceptable Manufacturers: Appleton, Raco, Steel City, Thomas & Betts, National Electric, or Crouse-Hinds.

## 2.02 OUTDOOR PULL BOXES

- A. Provide grade-mounted, precast polymer concrete, watertight, open bottom, heavy-duty gasketed covers, suitable for occasional non-deliberate heavy vehicle drive-over application, with logo.
- B. Acceptable Manufacturers: Quazite or approved equal by Synertech.

## 2.03 CONDUIT SYSTEMS

- A. Use electrical metallic tubing, intermediate metal conduit, or rigid steel conduit, as specified below:
  - 1. Threaded rigid or intermediate conduit is required where conduit is ANY of the following:
    - a. 2-1/2 in. or larger.
    - b. Exposed to physical damage.
    - c. Exposed within 8 ft. of finished floor.
    - d. Run in slab or in exterior walls.
    - e. Run in hazardous locations.
  - 2. Threaded rigid or intermediate conduit is required where vertical drops are made to equipment in open space. The vertical conduit shall be rigidly supported from the equipment, extend a minimum of 10 ft. above floor level, and be not less than 1 in. diameter.
  - 3. Steel thin-wall EMT up through 2 in. diameter may be used elsewhere in interior construction, where rigid or intermediate is not otherwise required.
  - 4. Schedule 40 PVC conduit may be installed below the ground floor slab WITH 24 IN. MINIMUM COVER. PVC conduit shall terminate below the slab and connect to rigid steel or intermediate metal riser conduit.
  - 5. Acceptable Steel/Aluminum Conduit Manufacturers: Allied, Steel Duct, Omega, Westerntobe, or LTV.
  - 6. Acceptable Nonmetallic Conduit Manufacturers: Arnco, Carlon, Certainteed, Condux, Georgia Pipe, or National Pipe.
- B. Flexible Steel Conduit: Final connections to motors and equipment subject to vibration or moisture shall be made with 3/4 in. flexible steel conduit, 18 in. to 24 in. long, with PVC jacket, and containing copper phase and ground conductors. Connections between recessed lighting fixtures and junction boxes may be installed using 1/2 in. flexible steel conduit not over 72 in. long.

- C. Metallic and nonmetallic surface raceway systems shall be complete with boxes, fittings, elbows, terminations, and all mounting hardware.
  - 1. Acceptable Manufacturers: Wiremold or approved equal by Panduit, Hubbell, or Thomas & Betts.

#### 2.04 STEEL CONDUIT FITTINGS

- A. Rigid or intermediate conduit fittings shall be threaded. EMT conduit fittings shall be compression type only. Conduit bodies shall be malleable iron, threaded for heavy wall conduit and compression type for EMT, with cadmium finish and cadmium-plated sheet steel covers. Provide neoprene cover gaskets for conduit body covers exposed to the weather.

#### 2.05 LIQUID-TIGHT FLEXIBLE METAL CONDUIT (LTFMC)

- A. LTFMC may be used in short lengths to provide some vibration isolation. Contractor may use 1/2 in. LTFMC in short lengths (5 ft. maximum) to match equipment hubs on such items as motors, damper operators, limit switches, and similar controls where it is impractical to use 3/4 in. fittings.
- B. Acceptable Conduit Manufacturers: Anaconda, Carol Cable, Eastern Wire and Conduit, Flexi-Guard, Inc., or International Metal Hose.
- C. Acceptable Fittings Manufacturers: Appleton, O-Z Gedney, or Thomas & Betts.

#### 2.06 BRIDLE RINGS

- A. Provide steel bridle rings for supporting low voltage cable above accessible ceilings.

#### 2.07 CABLE TRAY

- A. Basket: UL-listed, 4 in.-deep load depth, 12 in. wide, structural wire mesh, with 4-1/2 in. x 4-1/2 in. openings complete with splices, hold down clips, connectors, and single center support hangers.
- B. Acceptable Manufacturers: Chalfant or approved equal by M. P. Husky, B-Line, Flextray, or Wiremold.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Electrical Boxes:
  - 1. All boxes shall be rigidly supported from building structure independent of the conduit system. Boxes shall be screwed to studs; no "caddy clips" will be permitted. Boxes cast into masonry or concrete are considered to be rigidly supported.
  - 2. Flush boxes shall finish within 1/4 in. of surface of non-combustible materials. Boxes shall not project beyond finished surfaces.
  - 3. Flush-mounted fixtures in ceilings shall have branch circuit conduit terminated in a junction box above ceiling, but accessible through ceiling opening, and located at least 1 ft. away from the fixture. Use 3/8 in. flexible steel conduit connection between junction box and fixture housing. Pre-wired lighting fixtures may have the branch circuit conduit terminate in the fixture junction box, provided the box is sized sufficient for the wire and UL-labeled for 75 deg. C wire.
  - 4. Boxes installed in masonry walls shall be placed with top or bottom of box at the nearest block joint.
  - 5. Do not install boxes and conduit on metal liner wall panels of metal buildings; provide steel angle or Unistrut between columns or other similar rigid structural member



6. Flush device and outlet boxes in walls shall not be installed back-to-back. Offset for sound isolation.
  7. All junction boxes containing emergency power wiring shall be painted orange.
  8. All junction boxes containing fire alarm wiring shall be painted red.
  9. Outdoor pullboxes shall be set in concrete, with adequate bedding, and properly supported per Manufacturer's recommendations. In addition, open bottom boxes shall be set over a 6 in. gravel bed.
- B. Conduit and Raceway:
1. Square cut, ream, and file all conduit ends. Cut at least (5) threads and draw up tight.
  2. Clean and cap all empty conduits.
  3. ALL CONDUITS SHALL BE CONCEALED BY RUNNING IN CORE OF BLOCK WALLS, AND IN STUD WALLS AND CHASES, OR BY ROUTING OVER A LONGER DISTANCE. Exposed conduit will be permitted in electric and mechanical rooms and overhead in areas without dropped ceilings. Conduit shall be adequately supported from substantial structural elements of the building, such as beams, joists, purlins, and columns, using suitable straps, clamps, and hangers, and shall neither rest on, nor be supported from, piping, ductwork, or suspended ceilings.
  4. All conduits, including under-slab runs, shall be run perpendicular to walls and parallel to floors and ceilings. Secure conduits every 10 ft. and within 3 ft. of every bend, box, fitting, or coupling. NOTE: IN GARAGE AND SHOP AREAS, A MINIMUM OVERHEAD CLEARANCE OF 16 FT.-3 IN. ABOVE FINISHED FLOOR IS REQUIRED.
  5. DO NOT RUN CONDUIT EXPOSED ACROSS FLOORS.
  6. Do not install boxes and conduit on metal liner wall panels of metal buildings; provide steel angle or Unistrut between columns, girts, or other similar rigid structural member.
  7. Drop conduits down inside concrete block walls; do not install in insulation space.
  8. Lay out conduit system to avoid crossing building expansion joints insofar as possible. Where crossings of expansion joints are necessary, use O-Z Gedney Type "AX" or "TX" expansion fittings.
  9. Do not use field-fabricated bends containing indentations or elliptical cross-sections. All conduit bends shall be done with an approved bending device. No more than (3) 90 deg. bends will be allowed in any conduit run. Install pullboxes at 100 ft. on center or where more bends are required.
  10. Install insulated bushings and throat fittings on all conduit ends.
    - a. Bushings smaller than 1-1/2 in.: Use all metal with formed radius to prevent insulation damage.
    - b. Bushings 1-1/2 in. and larger: Use insulating type constructed of metal insert and bakelite plastic, molded to the metal insert.
    - c. Acceptable Manufacturers: O-Z Gedney, Thomas & Betts, or Appleton.
  11. The use of running threads, either concealed or exposed, is prohibited. Use split coupling equal to O-Z Gedney Type SP, Thomas & Betts, or Erickson.
  12. All threaded conduits entering panelboards, pullboxes, or outlet boxes shall be secured by galvanized locknuts (inside and outside) and insulated bushings.
  13. Install and identify nylon pull line or #16 galvanized iron wire in all empty conduits.
  14. Before pulling conductors, all conduits shall be continuous from outlet to outlet and shall be installed complete. Swab conduits free of all dirt, grease, and moisture before pulling conductors.
  15. Conduit runs:
    - a. Below slab in garage areas: Run conduit in garages below vehicular areas minimum 18 in. below floor slab.

- b. In concrete topping: No conduits larger than 1-1/4 in. shall be installed in concrete slab construction. Conduits in slabs shall be rigid and installed below wire mesh (exterior) and reinforcing steel (interior). Do not install conduit in concrete topping that is 2 in. or less in thickness. Minimum concrete cover over conduits shall be 1 in.
  - c. In Flexicore: Run conduit inside core wherever possible. Do not recess into flexicore.
  - d. Exposed on metal wall panels: Do not fasten to liner panel; support boxes and conduit from steel girts or other structural member.
16. Hazardous locations: All conduits in hazardous locations shall be sealed in accordance with 2008 National Electrical Code (NEC) Article 501.
- C. Liquid-Tight Flexible Metal Conduit (LTFMC):
- 1. Provide LTFMC for the following:
    - a. Motors and the motor branch circuit conduit (or motor disconnect switch where present).
    - b. Damper and valve motor operators and associated conduit or J-box.
    - c. Miscellaneous pilot devices such as aquastat; sprinkler waterflow, tamper, and pressure switches; proving and limit switches; etc.; and their associated conduit or J-box.
  - 2. Install a wired equipment grounding conductor with appropriate terminations in all LTFMC. Grounding wire shall be sized in accordance with 2005 NEC Article 250, except #12 AWG Cu shall be the smallest size ground wire permitted. Drill and tap a hole in motor pigtail box and other enclosures if a suitable ground lug attachment means is not provided. Spring steel box grounding clips are NOT acceptable attachments.
- D. "Exposed To View" Raceway: In "finished" areas where conduits cannot be concealed, neatly install surface-mounted raceway and fittings. COORDINATE EACH LOCATION WITH, AND OBTAIN SPECIFIC APPROVAL OF, A/E BEFORE PROCEEDING.
- 1. Fire alarm and line voltage power wiring shall be run in separate metallic surface-mounted raceway.
  - 2. Nonmetallic surface-mounted raceway shall be used for temperature control and Category 6 data wiring.

END OF SECTION 260533



## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Identify each piece of electrical equipment, such as switchboard, automatic transfer switch, disconnects, starters, power and lighting panels, and auxiliary systems, on the front cover or trim with its designated name or number/letter shown on the Drawings and with the voltage available within the panel and the source from where it is fed. Identify panelboards in finished areas on the inside cover.
- B. Install laminated plastic nameplates for equipment. Identification shall be as indicated on the following examples:

PANEL A  
208Y/120 volt, 3-phase, 4-wire  
From SWBD MDP

#### 1.03 ACCEPTABLE MANUFACTURERS

- A. Seton "Setmark" or approved equal by Brady, MSI, or Calpico.

### PART 2 PRODUCTS

#### 2.01 EQUIPMENT IDENTIFICATION

- A. Laminated plastic nameplates, sized for minimum 1/4 in. high white letters or numbers engraved into a black background, Gothic style.
- B. "Dymo" or similar tape type labels shall NOT be used.
- C. Type written panelboard schedules shall be included and installed inside panelboard covers.

### PART 3 EXECUTION

#### 3.01 COORDINATION

- A. Coordinate to ensure that the identification used by all Trades is uniform in type, style, and appearance.
- B. Coordinate the exact nomenclature to be used on equipment nameplates with the A/E.

#### 3.02 INSTALLATION

- A. Equipment nameplates shall be attached with stainless steel screws. Exception: Use compatible adhesive where screws might damage equipment.

END OF SECTION 260553



SECTION 260560 - REQUIREMENTS FOR COMPLETION OF ELECTRICAL WORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section OM 26 05 00, "Common Work Results for Electrical."
- B. Section OM 26 05 06, "Electrical Submittals."
- C. Section OM 26 05 07, "Electrical Operating and Maintenance Data."
- D. Section OM 26 05 10, "Electrical Tests, Adjustments, and Inspections."
- E. Section OM 26 05 53, "Identification for Electrical Systems."

1.03 DESCRIPTION

- A. Complete and submit the following list, which is a partial list of the items required prior to Contract Completion:
  - 1. Submittals. Refer to Section OM 26 05 06.
  - 2. Operational tests, adjustments, and inspections of all equipment and systems; report of final test of all special systems; and final report of electrical load balance, as required in Section OM 26 05 10, as well as other Sections.
  - 3. All required certifications, labels, Underwriters Laboratories, Inc., plaques, as required in Section OM 26 05 06 and Section OM 26 05 10, as well as other Sections.
  - 4. Protection and cleaning. Refer to Section OM 26 05 00.
  - 5. Operating and Maintenance Manuals. Refer to Section OM 26 05 07.
  - 6. Record Drawings. Refer to Section OM 26 05 00.
  - 7. Painting. Refer to Section OM 26 05 00.
  - 8. Guarantee. Refer to Section OM 26 05 00.
  - 9. Equipment identification. Refer to Section OM 26 05 53.
  - 10. Instruction of the Owner's personnel as required in this, as well as other, Sections.
  - 11. Spare parts as required in this, as well as other, Sections.
  - 12. Equipment warranties.

PART 2 PRODUCTS

2.01 SPARE PARTS

- A. Provide a receipt, signed by the Owner, for all spare parts and insert it in the Operating and Maintenance Manuals. Furnish (1) complete set of the following spare parts for the Owner's use after the guarantee period expires:

ITEM	QUANTITY
Spare fuses for each size and type of fuse used, and fuse pullers	(3)
Spare fuse cabinet	(1)
Touch-up paint for generator	1/2 gallon

Spare lamps of each type specified for the Owner's inventory.  
Refer to Lighting Fixture Schedule on Drawings.

10% (1) minimum

- B. Furnish lamp changer and turn it over to the Owner.
- C. Furnish any other parts mentioned elsewhere.

### PART 3 EXECUTION

#### 3.01 FINAL OPERATING TESTS AND PROCEDURES

- A. Refer to Section 26 05 10.

#### 3.02 INSTRUCTION OF OWNER'S PERSONNEL

- A. Contractor shall provide a minimum of (4) hours of in-service training for the system's operators. Provide all applicable user manuals and related training documentation.
- B. Provide training schedule and training outline for approval (45) days prior to Contract Completion.
- C. After all system operational tests have been completed, schedule an instruction period with the Owner. Schedule well in advance, so that all of the Owner's personnel may attend if they desire. Coordinate with the Owner and A/E for date and time of training sessions.
- D. Participate in training sessions. Instruct the Owner's personnel in the operation and maintenance of all systems and equipment. Use Operating and Maintenance Manuals to familiarize the Owner's personnel with equipment and procedures. Allow time as necessary for this instruction. Instruction shall include the following:
  - 1. Location of equipment and explanation of what it does (function).
  - 2. Reference to operating instruction manuals for record and clarity.
  - 3. Coordination of written and verbal instructions, so that the operation of each system is fully understood by operating personnel.
  - 4. Complete review of items contained in Operating and Maintenance Manuals.
  - 5. Discussion of maintenance procedures that must be followed by the Owner.
  - 6. Complete demonstration and explanation of each Special System.
- E. Obtain a signed and dated letter from the Owner, stating satisfactory completion of instruction, listing names of personnel instructed, and listing names of persons giving the instruction. Submit a copy to the A/E. Insert copies in each Operating and Maintenance Manual.
- F. Provide a copy of SAO Form No. 34, "Certificate of Equipment Demonstration," signed by the Owner.

#### 3.03 FOLLOW-UP INSPECTIONS

- A. Refer to Section 26 05 10.

END OF SECTION 260560

## SECTION 260702 - GAS DETECTION SYSTEMS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.
- B. All provisions and requirements of Division 26 apply to this section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section OM 23 09 33, "Electric and Electronic Control System for HVAC."
- B. Section OM 26 05 10, "Electrical Tests, Adjustments, and Inspections."

#### 1.03 QUALITY ASSURANCE:

- A. Standards:
  - 1. National Electrical Manufacturers Association (NEMA).
  - 2. National Fire Protection Association (NFPA).
  - 3. Underwriters Laboratories, Inc., (UL).

#### 1.04 DESCRIPTION

- A. Contractor is responsible for the Work described in this Section.

### PART 2 PRODUCTS

#### 2.01 GAS DETECTION SYSTEMS

- A. Supply and install n ACME CEL Series Multipoint & Multigas Centralized Detection and Control System consisting of the following: NEMA 12 central monitoring panels with status lights, double-pole double-throw fan relays, CO sensors and NO2 sensors. Panels and remote sensors/transmitters shall be by the same manufacturer.
- B. Refer to the drawings for location of the monitoring panels. Number of panels is as indicated on the drawings.
- C. The contractor is responsible for providing a complete and operable system including all hardware, material, wiring, etc. All interlocking wiring with mechanical equipment is the responsibility of the contractor.
- D. Refer to specification section 23 09 33 for complete sequence of operation for interlocking requirements with exhaust fans.
- E. It is the responsibility of the contractor to provide and install the recommended number of sensors required by the manufacturer.



- F. All wiring to be in conduit.

## 2.02 CONTROL PANEL

- A. The system shall use an addressable RS485 communication protocol. Each sensor shall be sequentially polled by the Control Panel. Sensor data shall be acquired and stored in the Control Panel memory.
- B. The ACME CEL Series Multipoint System shall use only a common 4-wire 14 gauge communication link between the Control Panel and the local sensor stations.
- C. The Control Panel shall have an LED display with an indicating light for each sensor location. This light shall blink slowly for low-level indication, blink quickly for high-level indication and be solid ON for alarm level indication. A liquid-crystal alphanumeric 4-line display shall provide PPM levels for each sensor station, shall indicate the gas being sampled at that location and its alarm status.
- D. The Control Panel shall have a keypad for programming purposes and the programming shall be password protected.
- E. The system shall have all of its components, including the controller, RS-485 communication module and relay outputs boards in a single enclosure. Multiple enclosures requiring inter-wiring are not acceptable.
- F. The equipment shall be CSA and/or ETL certified.
- G. "ON - OFF" : The Control Panel shall incorporate the necessary logic circuits to operate the exhaust/supply fans and the motorized dampers for fresh air and/or exhaust according to the specified logic of ventilation. For example, if the equipment operated by the 100 PPM CO contacts does not reduce the CO level below this value within 30 minutes (3 to 60 minutes adjustable), the Control Panel shall go on visual and audible alarm and also provide a contact for remote alarm indication or supervision.
- H. CONSTRUCTION: The CEL Control Panel shall be of solid ventilated 16 gauge steel construction. All electronic components shall be behind a locked door. There shall be no accessible switches or knobs on front of panel (except for override if specified). All electrical connections should be made to clearly identified terminals.
- I. SELF-CHECKING: Integrity of the system shall be under constant checking. Should a remote station not confirm a response, a fault condition will be displayed at the Control Panel with indication of faulty station location. A common alarm shall be locked in.
- J. TIME DELAY: The Control Panel shall include a time delay of approximately 30 minutes scheduled between the time a High Level is detected and the time visual display on unit cover or panel, audible alarm and closure of alarm contacts. This time delay is introduced in order to avoid nuisance alarms produced by short temporary conditions. The time delay also allows the ventilation equipment, previously started at a lower gas level below alarm conditions, a reasonable length of time to reverse the gas trend.
- K. Control Panel shall be capable of monitoring up to 20 sensors and controlling up to six ventilation zones (outputs signals). Each sensor shall be capable of controlling the activity of a specific zone, all zones or any combination of zones.

### 2.03. SENSOR STATIONS

- A. The wall or column mounted metal or PVC gasketed enclosure with vandalproof cover screws or a lockable clasp and shall not have any parts accessible from outside.

### 2.04 RESPONSE

- A. The local reaction time of the remote stations shall be in the order of a few minutes therefore avoiding unnecessary start-stops of ventilation equipment every time a car happens to stop in the vicinity of the sensor.
- B. The sensor's response to ambient conditions shall be interpreted by the detection circuitry according to selected levels. Information is converted for transmittal to Control Panel at scanning time.
- C. CO Sensor/Transmitter stations shall have LED's for visual indication of "Power-On", and an LED bar graph indicating concentration levels.
- D. Removing or disconnecting a local sensor station from the system shall not affect its operation as long as the "daisy-chain" connection to the other sensor stations is maintained.
- E. There shall be no maintenance required except for periodic simple calibration checks performed by introducing a known gas mixture into the sensor and verifying or adjusting the electronic response at the sensor location.
- F. CO Metal Oxide Semiconductor (MOS) sensors shall have a life expectancy of 5 years. NO<sub>2</sub> and other Electrochemical Cell sensors shall have a life expectancy of two years.

### 2.04 INSTALLATIONS

- A. Wiring : The interconnections between the Control Panel and Sensors shall be made by a required number of branches consisting of 4 conductor 14 gauge wires. Each branch shall support a total length of 800ft and a maximum of eight (8) sensors. For CO remote sensor stations must be mounted vertically according to the arrow on the sensor. Heights between 4 ft. (1.20 m) and 6 ft.(1.80 m) are usual. For NO<sub>2</sub> (Diesel Fumes): remote sensor stations must be mounted vertically according to the arrow on the sensor. Install NO<sub>2</sub> sensors at heights between 1 foot and 18 inches below the ceiling.
- B. CEL systems should be energized at all times. Supply 120/1/50 - 15A from dedicated circuit. It should be impossible to disconnect power to a CEL system in order to service other equipment.
- C. All equipment shall be interconnected at the factory and shipped factory calibrated after a 7-day operational test. The logic of the system shall be factory tested by simulated field conditions as specified. A report shall be furnished with the equipment.
- D. All electrical connections shall be made by the contractor according to diagrams shown on drawings furnished with the equipment by the manufacturer. Use 4-wire coded cable from station to station, maintaining color code. All wiring is low voltage (24V). All wiring to be in conduit.

## 2.05 OPTIONS

- A. Provide on Control Panel selector switches with pilot lights to manually override all of the fans controlled by the system.
- B. Provide in CEL Control Panel a battery back-up to maintain the system in operation during a power failure. A compact rechargeable battery shall be used because of the reduced power requirement of the CEL system.
- C. Provide a Remote Alarm Station furnished with Audible/Visual alarm with silencing button.
- D. Provide a 4-20 ma or 0-10V DC analog output signal based on the highest condition or on the average of conditions detected.
- E. After complete installation, a manufacturer's representative shall check the installation before the system is started. A written report shall be submitted to the engineers, contractor & owner.

## 2.06 OTHER ACCEPTABLE MANUFACTURERS

- A. Provide acceptable equipment as manufactured and provided by ACME, Macuro, Toxalert, or Brasch

END OF SECTION 260702

## SECTION 260900 - INSTRUMENTATION AND CONTROL FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section OM 23 09 33, "Electric and Electronic Control System for HVAC."

#### 1.03 SCOPE

- A. Provide all power, control, and interlock wiring and conduit, relays, control power transformers, auxiliary contacts, and fuses to provide complete and operating control systems and effect the proper sequence of operation of each equipment subsystem.
- B. Unless otherwise noted, provide all line voltage and low voltage wiring and conduit.

#### 1.04 DESCRIPTION OF CONTROL WIRING REQUIREMENTS

- A. Heat Pump: Provide weatherproof fused disconnect switch, fuses, power, and control wiring.
- B. Fan Coil Units: Provide power, and control wiring.
- C. Motor-Operated Dampers: Provide power and interlock wiring. Refer to specific units.
- D. Exhaust Fans: Wire to magnetic starter, wall switch, wall switch with pilot light, reverse-acting thermostat located at the exhaust fan as indicated on the Drawings. Interlock with gas sensors as required on drawings.
- E. Electric Water Heater: Provide power and control wiring.
- F. Electric Wall Heaters: Provide power and control wiring.
- G. Gas-Fired Infrared Heating System: Provide 120 volt power and low voltage wiring to thermostats and burners.
- H. Thermostats: Unless noted otherwise, provide rough-in boxes, control wiring, and conduit.
- I. Air Compressor: Provide disconnect switch and power wiring. Provide pilot light switch and wire to compressor starter.
- J. Electric Unit Heater: Provide disconnect, power & control wiring.
- K. Infrared Heater: Provide power & control wiring.

#### 1.05 WIRING DIAGRAMS

- A. Detailed wiring diagrams shall be provided for coordination of electrical equipment connections.

END OF SECTION 260900



## SECTION 260923 - LIGHTING CONTROL DEVICES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Provide the following lighting controls:
  - 1. Lighting contactors.
  - 2. Photocell.

#### 1.03 QUALITY ASSURANCE

- A. Standards:
  - 1. Underwriters Laboratories, Inc. (UL).
  - 2. National Electrical Manufacturers Association (NEMA).

### PART 2 PRODUCTS

#### 2.01 LIGHTING CONTACTOR

- A. Asco 917. Electrically operated, mechanically held, heavy-duty plated contacts, ampere and pole capacity as shown on the Drawings, 120 volt coil, interrupting capacity equal to 150% of rating, NEMA 1 enclosure. Refer to Drawings for load voltage. Provide 2-wire control module accessory #47 as to interface with programmable time clock (photocell).
- B. Other Acceptable Manufacturers: Approved equal by Square D Class 8903, General Electric, Cutler-Hammer/Westinghouse, or Siemens.

#### 2.02 PHOTOCCELL

- A. Paragon Model CW201-00. Weatherproof, adjustable illumination, 2,000 VA., 120 volt, 3-wire CDS photocell in tamperproof cast aluminum housing.
- B. Other Acceptable Manufacturers: Approved equal by Tork or Intermatic.

#### 2.03 WALL-MOUNTED MULTI-TECHNOLOGY PASSIVE INFRARED/ULTRASONIC OCCUPANCY SENSORS WITH MANUAL OVERRIDE

- A. Leviton Model OSSMT-MDW. Wall-mounted, UL-listed, self-contained, with (1) ultrasonic transmitter, (1) ultrasonic receiving transducer, sensitivity adjustment, adjustable 30-second to 30-minute time-delay OFF, power pack relay, 120 volt, and full 5-year warranty.
- B. Other Acceptable Manufacturers: Approved equal by Hubbell Building Automation, Sensor Switch, Lutron, or Watt Stopper.

### PART 3 EXECUTION

#### 3.01 LIGHTING CONTACTORS

- A. Mount lighting contactors at locations shown on the Drawing, and wire to exterior lighting circuits.

3.02 PHOTOCELL

- A. Mount on box on exterior of north wall of building below roof line in an inconspicuous location.
- B. Connect lighting loads to (photocell) (contactor[s]) as indicated on the Drawings.

3.03 WALL-MOUNTED MULTI-TECHNOLOGY PASSIVE INFRARED/ULTRASONIC OCCUPANCY SENSORS

- A. Mount sensors at locations shown on the Drawings, and wire to room lights to turn lights ON automatically when someone enters the room and OFF automatically after the room has been unoccupied for the time delay set on the sensor.
- B. Adjust sensor sensitivity and time delay to prevent nuisance switching of the lights.

END OF SECTION 260923

## SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

### 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 the following types of dry-type transformers rated 600 V and less, with capacities up to 750 kVA:
  - 1. Dry Type Distribution transformers.
  - 2. Buck-boost transformers.

#### 1.3 SUBMITTALS

- A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. 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. 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.
- D. Qualification Data: For testing agency.
- E. Source quality-control test reports.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.
- B. 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.
- C. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."



- D. Dry Type Distribution Transformers comply with 2016 DOE Efficiency Standards.
- E. Buck-Boost Transformers comply with NEMA ST 1, UL 506.
- F. Sound levels NEMA ST1-4 and ANSI C89.1.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

#### 1.6 COORDINATION

- A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ACME Electric Corporation; Power Distribution Products Division.
  - 2. Challenger Electrical Equipment Corp.; a division of Eaton Corp.
  - 3. Eaton Electrical Inc.; Cutler-Hammer Products.
  - 4. General Electric Company.
  - 5. Hammond Co.; Matra Electric, Inc.
  - 6. Micron Industries Corp.
  - 7. Siemens Industry, Inc.
  - 8. Sola/Hevi-Duty.
  - 9. Square D; Schneider Electric.
  - 10. Powersmiths.
  - 11. PQI.
  - 12. Mirrus.
  - 13. E-Factor

#### 2.2 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices except for taps.
  - 1. Internal Coil Connections: Brazed or pressure type.
  - 2. Coil Material: Copper.
- D. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
  - 1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
  - 2. Include special terminal for grounding the shield.
- E. Wall Brackets: Manufacturer's standard brackets up to 45 kVA.
- F. Fungus Proofing: Permanent fungicidal treatment for coil and core.

- G. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

### 2.3 DRY TYPE DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561.
- B. Provide transformers that are constructed to withstand seismic forces specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Cores: One leg per phase.
- D. Enclosure: Ventilated, NEMA 250, Type 2.
  - 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
  - 2. Ventilation shall be natural and not required use of fans to maintain ratings.
- E. Transformer Enclosure Finish: Comply with NEMA 250.
- F. Taps for Transformers 15 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.
- G. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
- H. Energy Efficiency for Transformers Rated 15 kVA and Larger:
  - 1. Complying with 2016 DOE Efficiency Standards.

### 2.4 BUCK-BOOST TRANSFORMERS

- A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with 2016 DOE Efficiency Standards and shall be listed and labeled as complying with UL 506 or UL 1561.
- B. Enclosure: Ventilated, NEMA 250, Type 2.

### 2.5 IDENTIFICATION DEVICES

- A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

### 2.6 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.91.
- B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

- D. Verify that ground connections are in place and requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
  - 1. Brace wall-mounting transformers as specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions and requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. All transformers except wall mounted shall be mounted on 4" concrete pads. Neoprene rubber vibration isolators shall be provided between transformer case and concrete pad. Connections shall be made with flexible conduit. Vibration isolation pads shall be ribbed neoprene rubber.

### 3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Measure and document transformer primary no load input currents and input/output voltages at startup. Measure and document output voltage and adjust transformer taps as required for correct voltage level for operation (3% of output level). If no load input currents vary by more than 20% from phase to phase, consult manufacturer and notify engineer (IR and primary resistance testing will be required).
- B. Remove and replace units that do not pass tests or inspections and retest as specified above.
- C. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
  - 1. Use infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
  - 2. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.
- D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

### 3.5 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

- B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.
  - C. Output Settings Report: Prepare a written report; recording output voltages and tap settings.
- 3.6 CLEANING
- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200



## SECTION 262413 - SWITCHBOARDS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Provide fusible switchboard with main and branch fusible switches as shown on the Drawings.

#### 1.03 RATINGS AND CAPACITY

- A. 3-phase, 4-wire. Voltage and ampacity as indicated on the Drawings.

#### 1.04 SINGLE PHASE PROTECTION

- A. Provide phase loss protection trip sensors and alarm on main switch.

#### 1.05 QUALITY ASSURANCE

- A. Standards:
  - 1. Underwriters Laboratories, Inc. (UL) 891.
  - 2. 2008 National Electrical Code (NEC) Article 408.

#### 1.06 ACCEPTABLE MANUFACTURERS

- A. Siemens Type "FC-1" or approved equal by Square D, Cutler-Hammer/ Westinghouse, or General Electric.

### PART 2 PRODUCTS

#### 2.01 FUSIBLE SWITCHBOARD

- A. Switchboard: Code gauge steel with welded steel base, factory-tested, factory-assembled, fully bussed.
- B. Customer Metering: Provide a multi-function, high accuracy, digital power metering instrumentation module equipped with LED display. The power metering module shall provide simultaneous measurements for current, voltage, and power parameters. Power meter shall be Siemens type 9200 or approved equal with a communications port for connection to energy management network.
- C. Bussing: Tin-plated copper, copper ground bus, and 50,000 amp. minimum RMS fault current rating.
- D. Branch Switches:
  - 1. Fusible switches shall be quick-make, quick-break type, voidable interlock, with rejection-type fuses and operating handle.
  - 2. Refer to Drawings for bus ampacity, switch rating, fuse sizes and types, special wiring, and construction.
- E. Bolted Pressure Switches:
  - 1. Unless otherwise noted, furnish fusible, bolted pressure switch for any switch unit rated 800 amps. or greater.

2. Acceptable Manufacturers: Pringle, Kelek, or Bolt-Loc.
- F. Future Space: Provide space for future switches as shown on the Drawings. Make provisions for an additional future section.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Mount switchboard on a minimum of 4" concrete base and provide for future expansion as shown on Drawings.
- B. Identify all switches with laminated plastic nameplates.
- C. Maintain all Code clearances around switchboard as required by 2008 NEC Articles 110 and 408.
- D. Provide approximately 6 in. x 4 in. engraved laminated plastic warning sign on Switchboard "MDP" reading "WARNING: EMERGENCY AND NORMAL POWER SYSTEMS ARE BOTH GROUNDED AT THIS LOCATION."

END OF SECTION 262413

## SECTION 262416 - PANELBOARDS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 DESCRIPTION

- A. Provide factory-assembled panelboards having main lugs or main breaker and branch breakers as shown on the Drawings.
- B. Provide GFI, shunt-trip, undervoltage trip, and HACR-rated and HID-rated circuit breakers as indicated on the Panel Schedule(s) or required for the load being served.

#### 1.03 QUALITY ASSURANCE

- A. Standards:
  - 1. Underwriters Laboratories, Inc. (UL) 50, 67, and 489.
  - 2. 2008 National Electrical Code (NEC).
  - 3. National Electrical Manufacturers Association (NEMA) PB-1, 1977, and NEMA AB-1, 1978.
  - 4. American National Standards Institute (ANSI) C 33.38
  - 5. Federal W-P-115b and W-C375B
- B. Panelboards provided with an integral transient voltage surge suppressor shall have the transient voltage surge suppressor installed, delivered, and warranted by the Electrical Distribution Equipment Manufacturer. Transient voltage surge suppressors shall meet UL 1449 Standard, Second Edition.

#### 1.04 RATINGS AND CAPACITIES

- A. Refer to Drawings for voltage, ampacity, and breaker requirements.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Siemens Type "P1/S3" ("Load Center") or approved equal by Square D, General Electric, or Cutler-Hammer/Westinghouse.

### PART 2 PRODUCTS

#### 2.01 PANELBOARDS

- A. Dead front, steel cabinet, baked enamel finish, concealed hinges, flush lock, typed circuit directory, copper bussing, separate ground and neutral bars, lugs and adapters suitable for feeder sizes (CU/AL), bolt-on thermal magnetic circuit breakers, tripped circuit indicator, 20 amp switching breaker rating, lock-on straps.
- B. Minimum interrupting capacity shall be 22,000 amps RMS.
- C. Furnish integral transient voltage surge suppressor with status indicator lights and a rated-for-minimum-peak surge current of 80,000 amps per mode.
- D. Furnish bolt-on breakers. For all air conditioning, compressor, and similar motor loads, furnish Type HACR breakers.



- E. Size (up to 400 amps): 20 in. wide x 5-3/4 in. deep; 40 in. wide for double tub panel(s).
- F. For double tub panels, furnish feed-through lugs and consecutive branch circuit numbering.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Furnish directory frames inside the door of each panel that shall contain a correctly typed directory card properly filled out to correspond to the circuit numbers on the Drawings. If room numbers assigned by the Owner do not match the room numbers on the Drawings, both sets of room numbers shall be cross-referenced and identified in the panel directory.
- B. Provide copies of all panel directories in Operating and Maintenance Manuals.
- C. Top of panelboard cabinet (box) shall be installed at 6 ft. above floor.
- D. Surface-mounted panelboard mounted on outside wall shall be shimmed 1/2 in. from wall and mounted on 3/4 in. thick painted plywood mounting board to permit back ventilation.
- E. All flush panelboards shall have (5) 1 in. spare conduits rising and turning out of the wall above the ceiling line for future use. Provide fire-resistant backing to maintain wall fire-resistance rating. General Trades Contractor shall provide wall recess.
- F. Coordinate all panel locations with other Contractors.
- G. Maintain all Code clearances around panelboards as required by NEC Articles 110 and 408.

END OF SECTION 262416

## SECTION 262726 - WIRING DEVICES

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section CS 26 05 60, "Requirements for Completion of Electrical Work."

#### 1.03 DESCRIPTION

- A. Provide wiring devices as indicated, including cover plates. Wiring devices shall be NEMA type approved for the environmental conditions prevailing.
- B. Provide GFI receptacles where required to comply with Code.
- C. Provide spare devices as listed in Section CS 26 05 60.
- D. Equipment Termination: Prior to rough-in, verify termination requirements, including, but not limited to, plug-receptacle configuration.
- E. All receptacles on emergency power shall be red, all other receptacles shall be white.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. 2008 National Electrical Code (NEC).
  - 2. National Electrical Manufacturers Association (NEMA).
  - 3. Underwriters Laboratories, Inc. (UL) Label.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Hubbell, Pass & Seymour, Cooper, Bryant, Wiremold, Walker, or Leviton.

### PART 2 PRODUCTS

#### 2.01 SWITCHES

- A. 20 amp, 120/277 volt, Construction/Heavy-Duty Specification Grade, back-wired and side-wired.

DEVICE	HUBBELL CAT. NO.
Single-Pole	CS1221-W
3-Way	CS1223-W
4-Way	CS1224-W
Pilot Light	HBL1221PL
Weatherproof	1795

2.02 RECEPTACLES

- A. 125 volt, Construction/Heavy-Duty Specification, 2-pole, 3-wire grounding, back-wired and side-wired.

DEVICE	HUBBELL CAT. NO.
20 Amp Single (EWC)	HBL5361-W
20 Amp Duplex	HBL5362-W
GFI Outlet	GF5362WA
Isolated Ground	CR5352WG
Weatherproof	(GFI) GFR5352WA

2.03 SPECIAL OUTLETS

- A. Voltage and Ampere capacity, multi-pole, grounding.

DEVICE	HUBBELL CAT. NO.
30 Amp, 250 Volt/1	HBL9330
20 Amp, 250 Volt/1	HBL5461W
50 Amp, 250 Volt/1	HBL7962

2.04 PLATES

- A. Plates for flush devices in interior partitions shall be Specification Grade stainless steel Type 302/304.
- B. Plates for flush devices in concrete block walls shall be Specification Grade stainless steel Type 302/304 "Jumbo" plates.
- C. Plates for devices in surface fittings shall be cadmium-plated steel surface covers. Covers shall fit without overlap and have round corners.
- D. Plates for heavy-duty outlets and for specialty switches and outlets required for auxiliary systems shall be stainless steel.
- E. All metal plates shall be grounded.
- F. Weatherproof plates for GFI duplex receptacles shall be Hubbell Cat. No. WP26M/MH single-gang, cast aluminum, gasketed with single latched lift cover suitable for GFI receptacle, and clearly marked "Suitable For Wet Locations While In Use" and "UL-listed."
- G. Weatherproof plates for switches shall be Hubbell Cat. No. HBL1795 clear silicone rubber bubble plate suitable for toggle switches.
- H. All coverplates for devices connected to the generator shall be red in color.

PART 3 EXECUTION

3.01 COORDINATION

- A. To ensure proper final connection, verify the NEMA receptacle configuration required with the Owner or Equipment Supplier.

3.02 INSTALLATION

- A. Switches shall be installed adjacent to strike side of door openings. Prior to roughing in, verify which side of the door opening is the strike side. Devices and cover plates shall be absolutely

plumb and horizontal with no visible gaps around edge of plates. Install top or bottom of box at nearest block joint.

- B. Install cover plates on all devices.
- C. Install galvanized, blank, screw, or hinge covers on all junction boxes.
- D. Install gang plates on gang devices.
- E. Install engraved flush switch plates at all locations indicated on the Drawings.
- F. Connect green insulated ground wire to each device grounding terminal. Wire to panel ground bar.
- G. All weatherproof outlets shall include ground fault-interrupting type receptacle.
- H. Flush mounted devices in walls shall not be installed back-to-back.

END OF SECTION 262726



## SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section OM 26 05 60, "Requirements for Completion of Electrical Work."

#### 1.03 DESCRIPTION

- A. Provide fused and non-fused disconnect switches as shown on the Drawings, and as required by Code.
- B. Fusible switches are indicated on Drawings with a subscript-indicated Buss fuse type/size.
- C. Provide overcurrent protection for equipment and wiring as required by NEC Article 240.
- D. Provide spare parts as listed in Section OM 26 05 60.

#### 1.04 QUALITY ASSURANCE

- A. Standards:
  - 1. Switches:
    - a. 2008 National Electrical Code (NEC).
    - b. National Electrical Manufacturers Association (NEMA) KS1-1975.
    - c. Underwriters Laboratories, Inc., (UL) 98.
    - d. American National Standards Institute (ANSI) C33.64.
  - 2. Fuses: UL 198.

#### 1.05 RATINGS AND CAPACITIES

- A. Refer to Drawings for ampacity, number of poles, NEMA type, and fuse type/size.

#### 1.06 ACCEPTABLE MANUFACTURERS

- A. Switches: Square D, Siemens, General Electric, or Cutler-Hammer/ Westinghouse.
- B. Switch Fuses: Bussmann, Ferraz-Shawmut, Edison, or Littlefuse.

### PART 2 PRODUCTS

#### 2.01 DISCONNECT SWITCHES

- A. NEMA heavy-duty Type HD, steel enclosure, dual-cover interlocks, HP-rated plated contacts, indicating handle and provisions for padlocking. Switches shall be NEMA Type approved for the environmental conditions prevailing. Provide Class R rejection fuse clips. Toggle-operated disconnect switches equal to Square D Class 2510 shall be acceptable for unfused loads less than 16 amps.

## 2.02 SWITCH FUSES

- A. Bussmann Type LPN-R. 250 volt, 600 amps and below. NEMA Class RK-1 and L, dual element, time delay, current-limiting, 200,000 amp. RMS symmetrical interrupting capacity, sizes as shown on the Drawings.
- B. Bussmann Type KRP-C "Hi-Cap." 601 amps and above. NEMA Class RK-1 and L, dual element, time delay, current-limiting, 200,000 amp. RMS symmetrical interrupting capacity, sizes as shown on the Drawings.

## PART 3 EXECUTION

### 3.01 DISCONNECT SWITCH INSTALLATION

- A. Locate disconnect switch to provide access and minimum 3 ft. clearance in front.
- B. Locate exterior disconnect switches minimum 2 ft. above grade.

### 3.02 INSTALLATION OF FUSES

- A. Coordinate fuse selection with the ampere draw and type of load being served.
- B. Install fuse reducers in all fusible switches where required on drawings.
- C. Provide spare fuse cabinet with (3) spare fuses for each size rating, fuse pullers, and a framed, typewritten list of fuse sizes. Install adjacent to switchboard; confirm location with the Owner. Provide copy of list in the Operating and Maintenance Manuals.

END OF SECTION 262816

## SECTION 262913 - ENCLOSED CONTROLLERS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

#### 1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section OM 23 09 33, "Electric and Electronic Control System for HVAC"

#### 1.03 DESCRIPTION

- A. Provide starters, contactors, control stations, and feeder and branch circuits to motors and equipment.
- B. Coordinate rough-in with equipment supplied. Wiring diagrams shall be furnished with equipment supplied.
- C. Provide thermal overload protection for all motors. No thermal protection shall exceed 115% of motor nameplate amperes. Overloads shall be sized in accordance with motor nameplate rating and service factor.
- D. Furnish minimum NEMA Size 0 starter. Furnish magnetic starter for each motor that is automatically controlled or interlocked with another motor or device.
- E. All 3-phase motor starters shall include overload protection for each phase and single-phase protection.
- F. Provide motor short-circuit protection.

#### 1.04 ZQUALITY ASSURANCE

- A. Standards:
  - 1. 2008 National Electrical Code (NEC) Article 430.
  - 2. National Electrical Manufacturers Association (NEMA).
  - 3. Underwriters Laboratories, Inc., (UL) Label.

#### 1.05 ACCEPTABLE MANUFACTURERS

- A. Allen-Bradley or approved equal by Square D, Siemens, General Electric, or Cutler-Hammer/Westinghouse.

### PART 2 PRODUCTS

#### 2.01 MOTOR STARTERS

- A. Manual motor starters (1/2 HP and smaller): Allen-Bradley Bulletin 600 or 609. Shall include toggle lever, neon pilot light, stainless steel cover and nameplate, and thermal overload relays in all legs. Shall be open construction for flush-mounting in switchbox. Cover plate shall match device plates.
- B. Magnetic motor starters (3/4 HP and larger motors, or where required for interlocking or automatic control): Multi-pole, NEMA-rated contactors with overload relays, nameplate, pilot light, and reset



in cover. Provide phase failure relay with time delay. Provide 120 volt control power transformer, HAND/OFF/AUTO selector switch, or ON/OFF pushbutton switch where indicated.

1. Control circuit voltage shall be 120 volts provided by control circuit transformer. Fuse each side of primary and (1) side of secondary with current-limiting fuses.
2. Include at least (1) spare set of N.O. auxiliary contacts. Provide additional contacts to interlock and control fans and equipment.
3. Single-phase magnetic motor contactor: Square D Class 8910. 120 volt coil, NEMA 1 enclosure.
4. 3-phase magnetic motor starter: Allen-Bradley Bulletin 509 or 512 (combination starter-disconnect).
5. Combination starters shall include a Class R fused disconnect switch.
6. Provide NEMA Type enclosure for the environment within which it is located.

## 2.02 MOTOR CONTACTORS

- A. For single-phase motors 1 HP and smaller, where required for interlocking or automatic control: Functional Devices, Inc., Model RIBT24O1B. UL-listed 20 Amp. 120V coil, SPDT enclosed power relay contact, plenum-rated NEMA 1 housing, high/low voltage compartments, LED pilot light, and 16 in. long line voltage wiring pigtails.

## PART 3 EXECUTION

### 3.01 MOTOR WIRING

- A. Provide all motor starters, contactors, and disconnects, except those furnished as a factory-installed integral assembly of packaged equipment.
- B. Provide power wiring to and from disconnect switches, motor starters, contactors, variable speed drives, and motors.
- C. Install and wire overhead door pushbuttons.

### 3.02 CONTROL AND INTERLOCK WIRING

- A. Provide all control wiring and conduit required to interlock and control equipment and systems. Provide auxiliary contacts to provide the sequence of operation described in Section 23 09 33.

### 3.03 MOTOR STARTER/CONTACTOR

- A. Motor locations shown on the Drawings are approximate. Obtain exact location of motors. **DO NOT ROUGH-IN BY SCALING THE ELECTRICAL PLANS.**
- B. Final connections to rotating equipment shall be made using flexible conduit. Where exposed to moisture, conduit shall be liquid-tight flexible equal to "Sealtite."
- C. Coordinate heater sizes with motor provided. Install heater sizes based on final balanced motor amperage draw. Provide additional heaters as needed. The Contractor shall be responsible for heaters in starters furnished as an integral part of mechanical equipment.
- D. Establish and verify correct motor rotation.

END OF SECTION 262913

SECTION 264313.01 - SURGE PROTECTION DEVICES FOR LOW-VOLTAGE ELEC. POWER CIRCUITS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Special Conditions, and Division 01, "General Requirements," Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Provide 208/120 volt, 3-phase surge protection device on Switchboard "MDP."
- B. Provide 3-phase surge protection device on Panelboards, as shown on Drawings.

1.03 QUALITY ASSURANCE

- A. Standard: Underwriters Laboratories, Inc., (UL).

1.04 ACCEPTABLE MANUFACTURERS

- A. Current Technology or approved equal by Liebert, efi Electronics, Advanced Protection Technologies, L.E.A. International, MCG Electronics, or the Panelboard Manufacturer.

PART 2 PRODUCTS

2.01 TRANSIENT VOLTAGE SURGE SUPPRESSORS — MAIN SWITCHBOARD

- A. Current Technology Model TG150-120/208-3GY. Provide 208/120 volt, 3-phase surge protection device on Switchboard "MDP" with neon status indicator lights, peak surge current of 150,000 amps per mode, UL 1449 Standard, Second Edition, and 5-year warranty. Wire to 100/3 switch fused at 70 amps with #2 AWG wiring.

2.02 TRANSIENT VOLTAGE SURGE SUPPRESSORS — BRANCH PANELBOARD

- A. Current Technology Model TG60-120/208-3GY. Provide 3-phase surge protection device with neon status indicator lights, peak surge current of 60,000 amps per mode, UL 1449 Standard, Second Edition, and 5-year warranty on all panelboards. Wire to 70 amp, 3-pole circuit breaker with #2 AWG wiring.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Factory-trained technician shall inspect and test transient voltage surge suppressor to ensure proper wiring, operation, and ground-to-neutral bond.
- B. Device shall be mounted as close as possible to the equipment it is protecting and is permitted to be installed within the equipment.

END OF SECTION 264313.01



## SECTION 265000 - INTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

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

#### 1.02 SUMMARY

- A. Section Includes:
  - 1. Interior lighting fixtures and lamps.
  - 2. Emergency lighting units.
  - 3. Exit signs.
  - 4. Lighting fixture supports.
- B. Related Sections:
  - 1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.
  - 2. Division 26 Section "Network Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
  - 3. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

#### 1.03 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. LER: Luminaire efficacy rating.
- D. Lumen: Measured output of lamp and luminaire, or both.
- E. Luminaire: Complete lighting fixture, including driver housing if provided.

#### 1.04 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. Energy-efficiency data.
  - 4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
  - 5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, drivers, and accessories identical to those indicated for the lighting fixture as applied in this Project.
    - a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- 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.

D. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

E. Product Certificates: For each type of driver for dimmer-controlled fixtures, from manufacturer.

F. 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.

G. Warranty: Sample of special warranty.

#### 1.05 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

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 NFPA 70.

D. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

E. Underwriter's Laboratory.

#### 1.06 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: 3 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining four years.

2. Warranty Period for Self-Powered Exit Sign Batteries: 3 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining two years.

#### 1.07 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. Lamps: 10 for every 100 of each type and rating installed. Furnish at least two of each type and no more than one full case.

2. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

3. Drivers/power supplies: One per 50 of type installed. Furnish at least one of each type.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

## 2.02 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Exit signs and Emergency Lighting: Comply with UL 924.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.
- F. Diffusers:
  - 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.
- G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and drivers. 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 characteristics:
    - a. CCT and CRI for all luminaires.

## 2.03 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. Cast aluminum construction; Wire guards.
- 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 or Li-ion 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.
    - f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

## 2.04 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
  - 1. Battery: Sealed, maintenance-free, lead-acid or Li-ion type.
  - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

## 2.05 LED SOURCES

- A. LED's shall be manufactured by Nichia, Samsung, Philips or Osram.
- B. Lumen output shall not decrease by more than 20% over the minimum operational life of 50,000 hours.
- C. Individual LEDs shall be connected such that a catastrophic loss or failure of one LED will not result in the loss of an entire luminaire.
- D. LED Boards shall be suitable for field maintenance or service below the ceiling with plug-in connectors. LED boards shall be upgradable.
- E. Light Color and Quality.
  1. Correlated Color temperature (CCT) range as per specification, between 3500K, 4100K and 5000K shall be correlated to chromaticity as defined by the absolute (X,Y) coordinates on the 2-D CIE chromaticity chart.
  2. The color rendition index (CRI) shall be 80 or greater.
  3. Color shift over 6,000 hours shall be less than 0.007 change in  $u' v'$  as demonstrated in IES LM80 report.
- F. Power Supply and Driver
  1. Driver: 120-277 volt, UL Listed, Sound Rated A+. Driver shall be >80% efficient at full load across all input voltages. Drivers shall be passively cooled only.
  2. Driver shall be suitable for full-range dimming. The luminaire shall be cable of continuous dimming without perceivable flicker over a range of 100% to 5% of rated lumen output with a smooth shut off function. Dimming shall be controlled by a 0-10V signal
  3. Driver disconnect shall be provided where required to comply with building codes.
  4. The surge protection which resides within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002 for Location Category A, where failure does not mean a momentary loss of light during the transient event.
- G. Luminaire shall be tested per IESNA LM 79-08.

## 2.06 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "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: 1/4-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

#### 3.01 INSTALLATION

- A. Lighting fixtures:
  - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
  - 2. Install lamps in each luminaire.
  - 3. No fixtures shall be installed until painting is completed. Fixtures with paint marks on them shall be replaced.
  - 4. All light fixtures shall be installed with centerlines symmetrical to the building, or at angles so designated by the plans. Fixtures not set thus shall be removed and reinstalled at this Contractor's expense.
  - 5. Any fixtures scratched, bent, cracked or in any way damaged before acceptance by Owner shall be replaced at this Contractor's expense.
  - 6. All lighting fixtures are to be grounded on the interior of the fixture housing, on clean bare metal (free of paint), by use of a pigtail and fastened by a screw used for no other purpose.
  - 7. All lamps shall be in working order at the time of final acceptance of the work by the Owner and Architect.
  - 8. All fixtures shall be thoroughly cleaned prior to the completion of the project. Fixtures designated as "Existing to be relocated" shall be thoroughly cleaned and re-lamped. Any fixture damaged during renovation or found to be unsuitable for re-use shall be replaced with a new equivalent fixture.
  - 9. Furnish all mounting straps, frames, rings, and other accessories required for a complete lighting installation. Refer to architectural room treatment schedule. If any conflict should occur with the building structure that will not allow proper installation of fixtures, the Architect shall be contacted before proceeding.
  - 10. Flush fixtures that have light leaks between the frame and ceiling shall have a gasket installed by this Contractor between the trim and the ceiling.
  - 11. This Contractor shall inform the General Contractor of location and framing details necessary for the installation of flush ceiling fixtures and deliver to the General Contractor all frames of these fixtures so that they become a part of the ceiling construction. This Contractor shall verify the actual suspension system to be used and make all adjustments in fixture installation provisions required thereby.
- 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. Remote Mounting of drivers: Distance between the driver and fixture shall not exceed that recommended by driver manufacturer. Verify, with driver manufacturers, maximum distance between driver and luminaire.
- D. Lay-in Ceiling Lighting Fixtures Supports:
  - 1. The Electrical Contractor is responsible to support each recessed light fixture with a support wire at all four corners of the light fixture. Fixtures shall be installed flush within ceiling suspension system.
  - 2. Surface mounted fluorescent fixtures shall be fastened at each of the four corners and fit tight to the ceiling suspension system.
  - 3. The T-bar shall not be cut out to provide room for the junction box.
  - 4. A few of the first fixtures shall be checked as soon as they are suspended, to determine if any sagging or twisting of the ceiling system exists, and if fixtures are firm and hang straight.
  - 5. The ceiling shall be checked for sagging after fixtures and lamps have been installed. Adjustments shall be the responsibility of the Electrical Contractor.
- E. 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.

### 3.02 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

### 3.03 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. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.
- C. 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.

### 3.04 STARTUP SERVICE

- A. All fixtures shall be burned in for at least 100 hours at full voltage prior to substantial completion. Replace any drivers or fixtures that fail during startup and burn in those again.

END OF SECTION 265100

## SECTION 270016 - ELECTRONIC DRAWING RELEASE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 ELECTRONIC DRAWING FILES

- A. AutoCAD Floor Plan Drawing Files for shop drawings are available through the Engineer. Drawing format shall be AutoCAD 2007 unless requested otherwise. Hand drawn shop drawings are not acceptable; therefore, submit shop drawings generated by AutoCAD or similar electronic drafting program. The Contractor shall sign and mail a completed "Request for Electronic Drawings Files" Form to the Engineer. Mail request form to: Veregy, Construction Administration Department, 885 Grandview Avenue, 3<sup>rd</sup> Floor, Columbus, OH 43215, or [tallen@veregy.com](mailto:tallen@veregy.com). The electronic files will be sent via email or CD to the address specified upon receipt of the signed agreement. The request for Electronic Drawings Files Form is attached at the end of this Specification Section and must be sent prior to drawings being released to Contractor.
- B. For projects designed using Building Information Modeling (BIM), electronic 2D files given to the contractor may be created by exporting from Autodesk Revit to an Autodesk AutoCAD file format. Due to the export process limitations, layering of different types of devices will not be present. It is the contractors responsibility to manually remove (erase rather than turn off layers) unwanted symbols and text that does not apply to the shop drawings/as-builts that they are creating and if multiple layers are desired it shall be the contractors responsibility to create the required layers. If the contractor is not capable of completing this, then the contractor shall hire a CAD consultant to assist in the shop drawing/as-built drawing creation.

### PART 2 - PRODUCTS (Not Applicable)

### PART 3 - EXECUTION

#### 3.1 AGREEMENT TO PROVIDE INFORMATION IN ELECTRONIC FORMAT

##### AUTHORIZED USE:

Veregy has been asked to provide this Contractor with electronic format versions of construction documents for this project.

The use of documents by this Contractor is limited to background information and sheet layout. No details, engineering seals or schedules will be provided. If a sheet is requested that contains only schedules and details, the sheet will be sent but only with border and sheet layout. This Contractor agrees that the documents shall not be used for any other purpose other than preparing either shop drawings, O&M manuals or as-built drawings for this project. This Contractor further agrees that it will obligate any recipient of the documents to agree in writing to be bound to all of the terms herein as if the recipient in this Agreement. Each recipient will agree to pass on the same contractual obligation to any other recipients permitted under this Agreement.

## INSTRUMENTS OF SERVICE

The documents, whether in hard copy of machine readable form, represent instruments of professional service and shall remain the property of Veregy. As the author of the documents, Veregy. retains all proprietary rights, including copyrights embodied therein.

## ACCURACY

Veregy. does not represent that all information contained in the documents is complete, noting that there could be subsequent changes to the documents. Furthermore, items shown in the documents may not be to scale.

This Contractor agrees to verify all information and dimensions indicated in the electronic documents by comparison to an original printed copy and promptly notify Veregy. of any discrepancies.

This Contractor acknowledges that anomalies and errors can be introduced into documents when they are transferred or used in an incompatible computer environment. Further, this Contractor 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 documents. The documents are being furnished "as is".

Electronic media viruses are ever increasing in complexity and growth. Veregy. advises all users to scan any disk received from outside sources with a current anti-virus program. Veregy. takes normal precautions to keep our system clean of viruses but, because no system is perfect, occasionally a virus may pass undetected. Veregy. will not be responsible for any damage cause by such a virus. If you detect any virus on any media received from Veregy., please contact us immediately.

## INDEMNIFICATION

To the fullest extent permitted by law, this Contractor agrees to indemnify, defend and hold Veregy., its officers, directors, shareholders, employees, agents and consultants harmless from and against any and all claims, liabilities, suits, demands, losses, costs and expenses, arising out of any use, reuse or modification of the documents, except where Veregy. is found to be solely liable as between the parties hereto, as well as between any other persons, firms or other legal entities for such damages or losses by a court or forum of competent jurisdiction.

Except as provided herein, this Contractor will not transfer the document or any copy of the document in any form to a third party without the prior written consent of Veregy., which may be withheld at the sole and absolute discretion of Veregy. If this Contractor fails to perform or observe any of the terms of this Agreement, Veregy. may demand and this Contractor agrees to immediately return the document and any copies thereof.

## LOCATION

This Agreement shall be governed by Ohio law, Franklin County.

#### LIMIT OF LIABILITY

To the fullest extent permitted by law, and notwithstanding any other provision of this Agreement, the total liability, in the aggregate, of Veregy., its officers, directors, employees, agents and consultants, to this Contractor and anyone claiming by, through or under this Contractor for any injuries, liabilities, claims, losses, expenses, costs of damages of any nature whatsoever arising out of, resulting from or in any way related to the documents or the Use of Documents, including, but not limited to, the negligence, professional errors, omissions, or breach of contract of Veregy., its officers, directors, shareholders, employees, agents or consultants, or any of them, shall not exceed one dollar (\$1.00).

Signing this Agreement indicates your agreement to the terms stated above. Unless otherwise explicitly agreed to in writing by both parties, this Agreement shall govern any and all future transfers or use of new documents, to this Contractor by Veregy.

Request for Electronic Drawing Files

I HAVE READ AND UNDERSTAND THE AGREEMENT TO PROVIDE INFORMATION IN ELECTRONIC FORMAT AS FOUND IN SECTION 27 00 16 - 3.1 AND FURTHERMORE; BY SIGNING THIS REQUEST FOR AN ELECTRONIC DRAWING FILES FORM, I AGREE TO ALL TERMS AND CONDITIONS. INFORMATION MUST BE ACCURATE AND COMPLETE TO ENSURE PROMPT RESPONSE.

Company: \_\_\_\_\_

Authorized Signature: \_\_\_\_\_

Name Printed: \_\_\_\_\_

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

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

INFORMATION TO FULFILL REQUEST:

Project Name: \_\_\_\_\_

Veregy Engineering Project Number: 21-178 \_\_\_\_\_

Contractor: \_\_\_\_\_

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

City, State, Zip Code: \_\_\_\_\_

Name: \_\_\_\_\_

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

Floor Plans Requested (Example: Floor 1 Technology Plan): \_\_\_\_\_

\_\_\_\_\_

Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

Format: AutoCAD Version: 2007 \_\_\_\_ or 2010 \_\_\_\_ Media Type: E-Mail \_\_\_\_ or CD \_\_\_\_

Send form to: Veregy., Construction Administration Department, 855 Grandview Avenue, Third Floor, Columbus, OH 43215, or e-mail [tallen@veregy.com](mailto:tallen@veregy.com).

END OF SECTION 270016

## SECTION 270100 – OPERATIONS AND MAINTENANCE OF COMMUNICATIONS 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 OPERATION, MAINTENANCE MANUALS, AND AS-BUILTS

- A. Submit one (1) digital copy of operation and maintenance manuals and one (1) digital copy of AutoCAD or Revit as-built drawings to the engineer for review and approval. Submit one (1) bound/hard copy and one (1) digital copy of operation and maintenance manuals in an 8-1/2 inch by 11 inch, 3-ring hardback binder and one (1) hard copy and one (1) digital copy of AutoCAD or Revit as-built drawings to the owner after review and approval by the engineer. Binders shall include a clear front cover and exterior binding edge cover that are labeled clearly. Larger sheets shall be folded and indexed in rear of binder enclosed in a clear zip-pouch pocket type holder bound with the other documents. The digital copy shall follow the same format as the hard copy.

- B. Provide a separate Operations and Maintenance Manual for the following Specifications:

1. 271100 Communication Equipment Room Fittings
2. 271300 Communication Backbone Cabling
3. 271500 Communications Horizontal Cabling
4. 275123 IP Based Central Sound System

- C. Format:

1. Title page: Title of Project, Owner, Address, Date of Submittals. Provide the name, phone, and address of the following: Contractor, Sub-Contractors, Distributors, Architect, Engineer, and Technology Consultant.
2. Second page: Index of Manual Contents.
3. First Section: A copy of each approved submittal shop drawing stamp received from the Engineer. Approved submittal shop drawing stamps shall read “No Exceptions Taken”.
4. Second Section: A list (corresponding to submittal shop drawings) of all equipment installed on the project, with distributor’s name.
5. Third Section: Brief but complete instructions for start-up, operation, shut-down, trouble-shooting and maintenance of systems.
6. Fourth Section: Operating and Maintenance Instructions for all applicable systems, including fire alarm, security, individual and central sound systems, telecommunication systems, lighting control systems, nurse call systems, and emergency generation control systems. Manufacturer's operating and maintenance manuals for equipment furnished under this Contract will be acceptable unless the system is customized for the particular project. All manuals shall include such items as complete operating instructions, system start-up, system shut-down, trouble-shooting tips, parts lists, and detailed maintenance instructions. Provide an installation or owner’s manual for all active (electrical powered) devices, containing the information described previously.

7. Fifth Section: Record drawings
    - a. Complete AutoCAD or Revit final as-built floor plan, equipment room, and system wiring diagrams for the systems referenced in the Fourth Section. Drawings shall be submitted in electronic (disk) format. Drawings shall be completed as AutoCAD or Revit.
  8. Sixth Section: Complete all required information on attached Equipment Training Sign-off Sheet.
- D. Provide multiple binders to maintain less than 75% capacity of each binder and ensure ease of use for the owner. Where multiple binders are required, break Section Four into a separate binder and Section Five into a separate binder at a minimum. The contractor also has the option of breaking individual systems into a complete binder. For example: CCTV System Binder may be referenced from the Main Project Binder and include the applicable Section Two, Four and Five information within it.
- E. As-built drawings shall be clearly marked with red ink indicating variation from contract drawings. Markings shall be legible and in a neat fashion. Field drawings marked in pencil will not be accepted.
- F. In addition the Operation and Maintenance manuals, the contractor shall also submit a Test Report Binder containing all of the test documentation required by the technology specification.

## PART 2 - PRODUCTS

Not Applicable

## PART 3 - EXECUTION

### 3.1 OWNER'S PERSONNEL INSTRUCTIONS

- A. After placing systems in operation, thoroughly instruct designated Owner's personnel on operation and maintenance of all equipment and systems.
- B. Refer to applicable system specification section and Division One for requirements regarding minimum training time. Instructions shall include the following at a minimum:
  1. Location of equipment and explanation of function.
  2. Review of operating instruction manuals.
  3. Basic operation of equipment and systems.
- C. The Contractor shall be responsible for arranging for the personnel training at a time convenient to the Owner or their representative and for notifying the Construction Manager of the time at least 10 work days in advance.
- D. Provide a completed Equipment Training Sign-off Sheet for all equipment and systems that have training specified.
- E. The Contractor shall provide a copy of the attached Equipment Training Sign-off Sheet during equipment training for the Owner to sign indicating that they have completed the equipment training session. At a minimum of ten work days prior to the first proposed training date the training sign-off sheet shall be submitted to the Construction Manager with proposed training dates identified. At the completion of the training sessions, the Contractor shall have the Owner or their representative's signature indicating that the requirements have been satisfied.

- F. Operation and Maintenance Manuals shall be utilized during training session to allow Owner review and comments. Operation and Maintenance Manuals shall be submitted to the Construction Manager for final review and approval upon completion of training.



EQUIPMENT TRAINING SIGN-OFF SHEET

Project Name: \_\_\_\_\_

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

Dynamix Project Number: \_\_\_\_\_

Contractor Representative's Signature: \_\_\_\_\_ Phone #: \_\_\_\_\_

Contractor Representative's Name: \_\_\_\_\_ Phone #: \_\_\_\_\_

Equipment Supplier: \_\_\_\_\_ Phone #: \_\_\_\_\_

Equipment Training Conducted By: \_\_\_\_\_ Phone #: \_\_\_\_\_

Equipment Covered: \_\_\_\_\_

Number of Hours Required for Training: \_\_\_\_\_

EQUIPMENT TRAINING ATTENDEES (Please Sign Below after Completing Training Session)				
Name	Company	Title	Phone Number	Fax Number

Owner's Representative's Signature: \_\_\_\_\_

Comment Section: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

END OF SECTION 270100

## SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

### 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.
- B. This section includes requirements for LEED Silver Certification based on “LEED for Schools.”
  - 1. Division 01 Section 01 74 19 “Construction Waste Management and Disposal” for additional LEED requirements for handling of construction waste, general waste, excess materials, packaging and recyclables.
  - 2. Division 01 Section 01 81 13 “Sustainable Design Requirements” for general Project LEED requirements and for additional LEED requirements specifically applicable to this section.

#### 1.2 SUMMARY

- A. This Section specifies technology infrastructure equipment including the following:
  - 1. Grounding and Bonding.
  - 2. Hangers and Supports.
  - 3. Conduits and Boxes.
  - 4. Cable Trays.
  - 5. Pull Boxes.
  - 6. Fire-rated sleeves.
- B. All work shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials.
- C. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.
- D. The Contractor must demonstrate to the Owner and Engineer that the systems are complete and complies with all operational requirements set forth in the plans and specifications.
- E. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.
- F. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the Engineer.

G. SCOPE OF WORK

1. GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

- a. Provide, install, and test a complete grounding system for the telecommunications infrastructure.
- b. Telecommunications Infrastructure components will achieve a common bond with the building's grounding electrode system.
- c. At minimum, the grounding system shall bond together all racks/cabinets, tray, ladder rack, and risers in each wiring closet (ER and TR).
- d. Bond each TR to the grounding electrode system and to the ER. Bond the resulting grounding system to the grounding electrode system and the Electrical grounding system at the main building ground point. Bond any additional points indicated in the Drawings.
- e. All equipment and associated installation shall comply with latest edition of ANSI-J-STD-607-C Standards as well as the NEC.

2. CABLE TRAY

- a. Furnish and install a flexible basket type cable tray system complete with all fittings according to requirements outlined in this specification and routed as shown on the plans.
- b. Non-basket type cable tray systems will not be accepted.

1.3 DEFINITIONS

- A. BC (Bonding Conductor for Telecommunications): An insulated copper conductor that bonds the TMGB to the service equipment (power) ground.
- B. TMGB (Telecommunications Main Ground Busbar): A copper ground reference busbar, typically installed in the Entrance Facility (EF) or Equipment Room (ER), and is bonded to the service equipment (power) ground by the Bonding Contractor.
- C. TGB (Telecommunications Grounding Busbar): A copper ground reference busbar typically installed in Telecommunications Rooms (TRs) and is bonded to the TMGB by the TBBC. The TGB references metallic entities in the TR space to the ground.
- D. TBBC (Telecommunications Bonding Backbone Conductor): A copper conductor extending from the TMGB to each TGB.
- E. TEBC (Telecommunications Equipment Bonding Conductor): An insulated copper conductor that bonds metallic items and equipment within the space to the TMGB and TGB.
- F. TBBIBC (Telecommunications Bonding Backbone Interconnecting Bonding Conductor): An insulated copper conductor that bonds two or more surfaces together before connecting to the busbar with a TEBC.
- G. EMT – Electrical Metallic Tubing
- H. RMC – Rigid Metallic Conduit

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets on all system components. Data sheets shall be neatly bound with title page, index/bill of materials, and tab dividers for each major section. If multiple products or configurations are shown on the same product document, the product and or configuration to be supplied and installed on this project shall be highlighted.
- B. Specification sheets shall be submitted on all items including cables types.
- C. Submit as a separate section of the submittal book, resumes of the key staff assigned to this project, listing their experience and qualifications including a statement of the contractor's qualifications and abilities. Provide detailed information showing how the contractor will provide engineering, CADD support, fabrication and testing of equipment prior to delivery to job site, and service after installation is complete.
- D. The format and details for the submittals shall include the following:
  - 1. A complete bill of materials listing the following:
    - a. Applicable section/paragraph number from the project specification.
    - b. Manufacturer's name, model number (shall match spec sheet) and product description.
  - 2. Specification sheets for all equipment used on the project shall be inserted in the same chronological order as appearing in the specifications. Pages printed or copied from the web page or instruction manuals will not be accepted.
- E. Shop Drawings: For cable tray and grounding system. Include plans, elevations, sections, details, and attachments to other work.
- F. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- G. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
- H. Grounding: Indicate location of grounding bus bars and its mounting detail showing standoff insulators and wall mounting brackets along with TBB routing locations.
- K. Shop Drawings are to be submitted together with product submittals as one complete submittal. Only complete submittals will be accepted for review and approval. Any partial submittals shall be rejected.
- L. Refer to Division 1 for any additional requirements.

#### 1.5 QUALITY ASSURANCE

- A. The intent of this specification is to describe and provide for a complete system of professional quality suitable for constant use in an institutional setting.
- B. The supplier or sub-contractor for these systems must be a single firm whose primary business is the supply and installation of systems described herein.

- C. The supplier or sub-contractor must show a successful record of installations of similar size and complexity over the past five years that were installed and commissioned by their own forces.
- D. All major equipment for this specification shall be supplied by an authorized dealer of said equipment, who maintains a facility with adequate space for fabrication, assembly and testing of racks, clusters, and ancillary equipment, who owns all test equipment required for installation of systems, and has the facilities and staff to produce shop drawings, submittals, owners manuals, and training documents required by these specifications.
- E. This Contractor will be responsible for ensuring that their suppliers and sub-contractors meet the above requirements, and are authorized dealers for the equipment supplied with full warranty privileges and adequate service stock to meet the requirements of this specification.
- F. All work under this specification will be performed under the supervision of an individual who is experienced with the requirements for installation of a system as described herein, and documented successful experience testing, adjusting, balancing, equalizing, and operating said systems. Provide resume of project leader with submittals showing conformance to above requirements.
- G. Contractor is responsible for coordinating all rough-in locations with actual equipment furnished, and verification of dimensions and conditions at the job site, which might affect the systems installation.

#### 1.6 COORDINATION

- A. Connecting pathways, cables, and cable trays shall be clear of obstructions and shall not interfere with the working and access space of other equipment. Coordinate the arrangement, mounting, and support of communications 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.
- 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 communications items that are behind finished surfaces or otherwise concealed.
- D. Coordinate sleeve selection and application with selection and application of fire-stopping specified in Division 07 Section "Penetration Firestopping."

#### PART 2 - PRODUCTS

##### 2.1 CONDUITS AND BOXES

- A. CONDUIT – Electrical Metallic Tubing (EMT)
  - 1. Thin wall conduit shall be electrical metallic tubing and shall comply with UL 767 and ANSI C80.3.

2. All wiring in the building interior, including horizontal distribution, vertical riser conduits and auxiliary wiring may be run in EMT conduit. Conduit sizes larger than 4" shall be rigid metallic conduit.
3. EMT shall not be used in poured concrete, underground, in utility tunnels or exposed in mechanical equipment room below 48".
4. All EMT connectors and couplings shall be of the setscrew type. All fittings shall be steel. No die cast fittings will be allowed.
5. Approved connector manufacturers are Raco, Thomas & Betts, Crouse-Hinds, or Appleton.

#### B. BOXES

1. Flush outlet boxes shall be pressed steel galvanized and shall be a minimum of 4" square. Steel boxes to be cast in concrete shall be designed for concrete installation.
2. Provide a device plate to suit each particular application. Cover all empty outlet boxes with a blank plate.
3. Plates for exposed outlets in unfinished spaces shall have a 4" square galvanized surface covers for the application required. Covers shall be raised 1/2" and edges fit flush with the top of the box.
4. Approved outlet box and cover plate manufacturers are Raco, Appleton and Thomas & Betts.

### 2.2 HANGERS AND SUPPORTS

#### A. J-HOOKS

1. In areas of the building not being provided with cable tray or conduits stubbed out to the cable tray provide J-Hooks for proper cable support.
2. J-Hooks shall be specifically designed for interior use with data cables.
3. J-Hooks shall be provided with all of the manufacturer's recommended installation hardware for the installation application.
4. Approved J-Hook manufacturers are Cooper, Caddy, Panduit, Mono-Systems, or Arlington.

#### B. BRIDLE RINGS

1. Bridle rings shall be made of steel, rated for indoor use in non-corrosive environments.
2. Bridle rings shall be UL listed.
3. Shall have an ultimate static load limit of 50 lbs.
4. Shall be able to be assembled to manufacturer recommended specialty fasteners for connection to building structures like beam, drop wire/rod, purlin, wood structure, concrete and acoustical tee grid.
5. Under no circumstance shall bridle rings be used to support any data or voice cable.

### 2.3 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

#### A. GROUNDING AND BONDING BUSBARS

1. Telecommunications Main Ground Bar (TMGB):
  - a. Electro-tin plated 1/4" thick copper bar.
  - b. Insulated stand-offs.

- c. 15 pairs of 5/8" holes and 3 pairs of 1" holes.
- d. 4" high x 12" wide.
2. Design Basis Telecommunications Main Ground Bar (TMGB) – Chatsworth 40153-012, Panduit GB4B0612TPI-1, or Hubbell HBB14416H.
3. Telecommunications Ground Bar (TGB):
  - a. Electro-tin plated ¼" thick copper bar.
  - b. Insulated stand-offs.
  - c. 8 pairs of 5/16" holes and 3 pairs of 7/16" holes.
  - d. 2" high x 12" wide.
4. Design Basis Telecommunications Ground Bar (TGB) – Chatsworth 13622-012, Panduit GB2D0008TPI-1, or Hubbell HGRKTTGB10A.
5. Equipment Rack Busbar:
  - a. 3/16" thick x .75" high x 19" wide rack-mount ground busbar for equipment racks and cabinets.
  - b. Mounts to standard mounting rails.
  - c. 8 #6-32 tapped holes and 2 pairs of 5/16" holes.
6. Design Basis Equipment Rack Busbar – Chatsworth 10610-019, Panduit RGRB19U or Hubbell HBBBHR19KT.

#### B. BONDING CONDUCTORS

1. All bonding conductors shall be constructed of bare, soft annealed copper per ASTM B-3 and have a high dielectric PVC insulation per UL-3 and UL-1063. Overall jacket shall conform to UL-83 for THHN-THWN type cables.
2. Jacket coloring for the bonding conductor shall be green. If green is not available, the contractor is to identify the cable as being a bonding conductor by providing a 2" wide band of green electrical tape at each end of the bonding conductor and at each accessible path throughout the conduit system.
3. The BC and TEBC shall be #6 AWG, minimum; The TBBC shall be a #3/0 AWG; The TBBIBC shall be #6 AWG, minimum.

#### C. BONDING CONDUCTOR TERMINATIONS

1. One hole compression lugs: Thomas & Betts, "Long Barrel One Hole Lugs" color code orange (example Catalog Number 54905BE) high conductivity wrought copper, electro-tin plate, or equal by Chatsworth, Erico or Burndy.
2. Two hole compression lugs: Thomas & Betts, "Two Hole Lugs Long Barrel Type" color code blue (example Catalog Number 54816BE) high conductivity wrought copper, electro-tin plate, or equal by Chatsworth, Erico or Burndy.

#### 2.4 CABLE TRAY

- A. Basket cable tray shall have minimum depth of 6", width of 18" and 2"x4" grid spacing (unless noted otherwise on plans).

- B. Cable tray shall be either mill galvanized or electroplated zinc after manufacturing.
- C. Basket cable tray must be UL approved, labeled for use as an equipment ground conductor and comply with all NEMA standards concerning radius, load capacity, depth, and supporting means.
- D. If the cable tray is not labeled for use as an equipment ground conductor, each joint shall be connected with bonding conductors for an absolute ground.
- E. All items such as barrier strips (if required), special splices, wall and ceiling hangers, hold down clips, box connectors, end plates, etc. and shall be furnished as necessary for a complete installation.
- F. Provide radius fittings, dropouts and all other required accessories to transition from the cable tray to the racks, cabinets and backboards in the Technology Closets.
- G. Design Basis 18" Cable Tray – Chatsworth 34831-618 or equal by Cablofil, Cooper, Cope, MP Husky, Mono-Systems, Niedax, Chalfant, Snake Tray "Mega Snake", and WB Tray.

## 2.5 PULL BOXES

- A. Pull boxes shall be manufactured for use as a junction box and pull box in commercial and general industrial applications.
- B. Covers shall be secured to the enclosure body with plated screws through keyhole slots provided in the cover.
- C. Finish shall be a phosphate undercoat with ANSI 61 gray acrylic electrocoat finish.
- D. Pull boxes shall comply with NEMA standards Type 1 and be UL 50 listed.
- E. Pull boxes shall be provided in the sizes as indicated on the plans. Pull boxes shall have holes punched or cored through the enclosure body to provide access into the enclosure for the conduits indicated on the plans.

## 2.6 FIRE-RATED SLEEVES

- A. Wiring devices:
  - 1. Cables passing through fire-rated floors or walls shall pass through fire-rated wiring devices which contain an intumescent insert material that adjusts automatically to cable additions or subtractions.
  - 2. The device (per code requirements) shall include both internal and external firestopping.
  - 3. Cables penetrating through fire-rated floors or walls shall utilize fire-rated pathway devices capable of providing an F rating equal to the rating of the barrier in which the device is installed.
  - 4. The device shall be tested for smoke leakage (L rating) and shall not require the use of any optional sealing materials to achieve the published rating.
  - 5. The device shall utilize a fire and smoke sealing system that automatically adjusts to the addition or removal of cables.
  - 6. Wiring devices shall be capable of allowing a 0 to 100-percent visual fill of cables.
  - 7. Wire devices shall be of a sufficient size to accommodate the quantity and size of electrical wires and data cables required and shall be suitable for use with new or existing cable installations.



8. The installed device (in normal use) shall require no maintenance and shall accommodate future cable changes without mechanical adjustment and/or removal or replacement of protective materials.
9. Wire devices to be provided with steel wall plates allowing for single or multiple devices to be ganged together.
10. The device shall be modular and shall provide mechanical installation options for common wall and floor constructions as well as common construction conditions including over-sized or damaged openings or existing sleeves.

B. Acceptable Manufacturers:

1. Specified Technologies: EZ-PATH Fire Rated Pathway (4" conduit equivalent)
2. Hilti: 4" Speed Sleeve (CP-653)
3. Wiremold FlameStopper (4" conduit equivalent)

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS 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 communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 HANGERS AND SUPPORTS

- A. J-Hooks shall be installed within (1) one foot of the bushed conduit ends stubbed above the ceiling and within (1) one foot of any bend greater than 60 degrees.
- B. J-Hooks shall be installed with a maximum center to center distance of (4) four feet. J-Hooks installed with a center to center distance greater than (4) four feet, shall be reinstalled by the contractor at no additional cost to the project.
- C. All J-Hooks shall be attached securely to the wall, ceiling joists or concrete deck above utilizing the manufacturer's recommended hardware and installation practices. Contractor shall utilize unistrut and threaded rod assemblies to maintain the (4) four foot center to center requirement between ceiling joist members.

### 3.3 CONDUIT AND BOXES

- A. All conduits entering cabinets, pull boxes, junction boxes or outlet boxes shall be secured with set-screw type box connectors.
- B. The ends of all conduits utilized for communications cabling shall be provided with nylon push-on bushings and a pull string provided throughout.
- C. All conduit runs shall have a maximum of two (2) 90 degree bends per conduit run. When more bends are necessary in a single run a pull box shall be installed. Pull boxes shall not be installed in place of a 90 degree bend. Pull boxes shall also be installed in long runs at a maximum separation of 100'.
- D. All conduits, except in concrete slab or earth, shall be routed parallel and perpendicular to the column lines of the building.
- E. Conduits that are not installed plumb and routed perpendicular to the structural column supports of the building will not be accepted.
- F. Unless otherwise noted, all conduits shall be run concealed within the building construction when installed in finished interior or exterior areas.
- G. All conduits shall be substantially supported by use of pipe straps, suitable clamps or hangers attached to elements of the building structure to provide a rigid installation. Under no circumstance shall conduit be attached or supported from adjoining pipe or installed in such a manner as to prevent the readily removal of other pipe for repairs.
- H. Install bottom of outlet box on the mortar joint with the outlet box cut out of the bottom of the CMU installed on the same mortar joint.
- I. Unless otherwise noted, install all outlet boxes vertically.
- J. Install outlet boxes at the mounting heights indicated on the plans. Communication outlet boxes adjacent to electric outlets shall be installed at the same mounting height. Any discrepancy shall be brought to the attention of the Architect and Engineer prior to rough-in.
- K. Where a space contains both CMU and another wall type, install outlet boxes at height indicated for CMU wall type spaces.
- L. Install outlet boxes so that finish plates do not span different types of building finishes.
- M. Architect/Engineer reserves the right to modify outlet locations prior to installation without any extra cost.

### 3.4 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, gypsum, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

- C. Cut wall sleeves to provide 2” of exposed conduit on both sides of the wall. Provide nylon push-on bushings on both ends and a pull string throughout.
- D. Extend floor sleeves 4” above and below the finished floor level. Provide nylon push-on bushings on both ends and a pull string throughout.
- E. Seal space outside of sleeves with grout for penetrations of concrete and masonry
  - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- F. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- G. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- H. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- I. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals.

### 3.5 GROUNDING AND BONDING SYSTEM INSTALLATION

#### A. GENERAL

- 1. Ground electrical systems and equipment per code, utility, local ordinances, and requirements herein.
- 2. Bonding conductors shall be continuous and routed in a direct path to point of termination.
- 3. All grounding busbars shall be isolated from the structure by a 2” minimum separation using manufacturer’s recommended insulating stand-offs and hardware.
- 4. Install #3/0 AWG insulated copper grounding conductor from main building grounding electrode system at service entrance to ground bus at the TMGB. Conductors shall be installed in continuous 1” EMT conduit.
- 5. Install #3/0 AWG bare copper grounding conductor(s) from the TMGB ground bus to each ER/TR ground bus.
- 6. Install grounding bushings on conduit and bond, using Green #12 AWG wire, at both ends. Paint all conduit fittings, junction boxes and covers “GREEN.”
- 7. Install Green #6 AWG bonding jumper (12” maximum) with appropriate lugs at each cable tray joint or install manufactured braided copper grounding jumper equal to B-Line #CAM-GJ, T&B #BD12, OZ/Gedney type “FB” or Mono-Systems.
- 8. Install Green #6 AWG grounding conductor with appropriate lugs from side of cable tray down to ground busbar. Drill # tap side of cable tray (for appropriate size bolt, ¼” x 20 minimum), making sure that bolt does not extend into wire management part of tray.

B. LABELING

1. Label the TEBCs consecutively within each closet TEBC-01 through TEBC-xx with “xx” representing the last number in order.
2. Label all TGBs and the TMGB with the following:

WARNING!!!  
IF THIS CONNECTOR OR CABLE IS  
LOOSE OR MUST BE REMOVED  
PLEASE CALL THE  
TELECOMMUNICATIONS MANAGER

C. CONNECTIONS

1. Bond the TMGB to the service equipment (power) ground, typically located in the electrical entrance facility, using the most direct route possible to minimize conductor length.
2. Bond the following to the TMGB when present:
  - a. Telecommunications panel board.
  - b. Alternating Current Equipment Ground Bus (ACEG), if equipped, or its enclosure.
  - c. Building structural steel, if exposed. (Steel rebar of reinforced concrete are not required to be bonded).
  - d. Metallic equipment racks.
  - e. Cable shields.
  - f. All metal raceways and cable trays for telecommunications cabling extending from the same room or space where the TMGB is located.
3. Bond the following to the TGB when present:
  - a. Telecommunications panel board.
  - b. Alternating Current Equipment Ground Bus (ACEG), if equipped, or its enclosure.
  - c. Building structural steel, if exposed. (Steel rebar of reinforced concrete are not required to be bonded).
  - d. TGBs within the same space if provided.
  - e. TBBs terminated on the same floor to other TGBs.
  - f. Metallic equipment racks.
  - g. Cable shields.
  - h. All metal raceways and cable trays for telecommunications cabling extending from the same room or space where the TMGB is located. FIRESTOPPING.
4. All BC and TBB conductors shall be terminated with two-hole compression lugs. All TEBC conductors shall be terminated with two-hole compression lugs.

D. BONDING

1. Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

2. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
3. Make connections with clean bare metal at points of contact. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
4. Exothermic welded connections: Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
5. Tightening: Tighten grounding and bonding connectors and terminals in accordance with the manufacturer's published tightening methods and practices. Where manufacturer's requirements are not indicated, tighten connections to comply with UL 486A and UL 486.
6. Compression-type connections: Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indicating that a connector has been adequately compressed on the ground conductor.
7. Moisture protection: Where insulated ground conductors are connected to ground rods, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

E. TRAINING

1. Provide eight hours of training for the owner on the system described herein.
2. The contractor shall show the owner all main connection points for the system, and explain the function of the system and each major component type. The contractor shall instruct the owner in any maintenance requirements, and procedures to be followed when new equipment is added to the system in the future.
3. Provide information on all systems including any applicable test results in the owners and operators' manuals.
4. This training shall be digitally recorded and two copies in DVD or digital format shall be turned over to the owner with the close out documents.
5. Contractor shall obtain a sign-off from the owner that they have received adequate training for the equipment. The contractor shall submit this form with their as-built information to be delivered to the owner.

3.6 CABLE TRAY

- A. Provide basket cable tray above corridor ceiling along entire corridor span. Cable tray shall be installed utilizing wall-mount brackets, where field conditions allow, along the edge of the corridor as shown on the detailed plans.
- B. Provide cable tray in the Technology Control Room (ER) and Technology Rooms (TR) as shown on the detailed plans.
- C. Maintain 12" clear space from fluorescent light fixtures, 6" clear space from the top of the cable tray to any obstruction, 6" clear space from bottom of cable tray to above the ceiling height, and 36" clear space from any transformer.
- D. The contractor shall be responsible for the coordination of the cable tray placement to ensure the proper clearances and mounting locations can be obtained.

- E. If 6" clear space from the top of the cable tray can not be maintained, the contractor shall provide (3) 4" sleeves through the obstructed area.
- F. Provide any required changes of elevations with a gradual slope up/down of cable tray in the field to avoid other trades' work.

### 3.7 PULL BOXES

- A. Pull boxes shall be provided in the sizes as indicated on the plans.
- B. Pull boxes shall have holes punched or cored through the enclosure body to provide access into the enclosure for the conduits indicated on the plans.
- C. All conduits entering the pull box shall be secured with set-screw type box connectors.
- D. Pull boxes shall be installed in such a manner that provides easy access into the installed enclosure through the removable cover.
- E. Under no circumstance shall a pull box be installed with the cover facing up. Unless conduits entering the box must be stacked vertically, all pull boxes shall be installed with the cover facing down.
- F. Pull box locations shall be coordinated with other trades to provide adequate clearance between the pull box cover and any other object. The minimum clearance required shall be six times the diameter of the largest conduit entering the pull box.

END OF SECTION 270500



## SECTION 270510 – TELECOMMUNICATIONS ADMINISTRATION AND LABELING

### 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.
- B. Related Sections
  - 1. Division 27 Section “Communications Horizontal Cabling” for structured cabling associated with system panels, outlet connectors and devices.
  - 2. Division 27 Section “Communications Backbone Cabling” for cabling, system panels and 110 Wall field terminations.

#### 1.2 SUMMARY

- A. This Section specifies the methods and materials required to provide proper documentation for system administration through computer generated labeling for:
  - 1. Communication Backbone and Horizontal cables.
  - 2. Grounding and Bonding cables and busbars.
  - 3. Horizontal and Vertical Pathways.
  - 4. Conduits, Sleeves and Slots.
  - 5. Communication Equipment.
  - 6. Outlets and connectors.
  - 7. Audio Systems
  - 8. Video Systems
- B. All work shall be performed by technicians trained in proper use and installation methods of field generated or computer generated labels.
- C. All work shall conform to the most current ANSI/TIA/EIA 606-C and BICSI standards.
- D. All labeling shall be permanent and be legible for a period of 25 years.
- E. The Contractor must demonstrate to the Owner and Engineer that the systems are completely labeled and all associated final as built wiring schematic and detail documentation matches the labeling scheme utilized on the project systems.
- F. The Contractor shall provide all miscellaneous items and accessories required to make the Telecommunications Administration & Labeling system complete whether or not such items are specifically mentioned in the plans and specifications.
- G. Hand Written or “P-Touch” labeling systems will not be acceptable.



## H. SCOPE OF WORK

### 1. LABELING FOR COMMUNICATIONS SYSTEMS

- a. Identifier(s) – An identifier is used in labeling telecommunications infrastructure components such as cable, racks, telecommunication rooms, equipment rooms, pathways and telecommunication outlets/connectors. Each identifier shall be a unique alpha-numeric identification that will not be repeated with the administration of the system.
- b. Labeling – Labeling is the marking of an element of a telecommunications infrastructure with the appropriate identifier and other relevant information. Labeling may occur in two ways, Labels may be securely attached to the element or, the element itself may be marked directly.
- c. Cable label material shall be suitable for the building, room, rack, cable, or cabinet environment.

### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets on all system components. Data sheets shall be neatly bound with title page, index/bill of materials, and tab dividers for each major section. If multiple products or configurations are shown on the same product document, the product and or configuration to be supplied and installed on this project shall be highlighted.
- B. The format and details for the submittals shall include the following:
  1. A complete bill of materials listing the following:
    - a. Applicable section/paragraph number from the project specification.
    - b. Manufacturer's name, model number (shall match spec sheet) and product description.
  2. Specification sheets for all equipment used on the project shall be inserted in the same chronological order as appearing in the specifications. Pages printed or copied from the web page or instruction manuals will not be accepted.
- C. Shop Drawings are to be submitted together with product submittals as one complete submittal. Only complete submittals will be accepted for review and approval. Any partial submittals shall be rejected.
- D. Refer to Division 1 for any additional requirements.

### 1.4 QUALITY ASSURANCE

- A. The intent of this specification is to describe and provide for a complete system of professional quality suitable for constant use in an institutional setting.
- B. The supplier or sub-contractor for these systems must be a single firm whose primary business is the supply and installation of systems described herein.
- C. The supplier or sub-contractor must show a successful record of installations of similar size and complexity over the past five years that were installed and commissioned by their own forces.

- D. This Contractor will be responsible for ensuring that their suppliers and sub-contractors meet the above requirements, and are authorized dealers for the equipment supplied with full warranty privileges and adequate service stock to meet the requirements of this specification.

## 1.5 COORDINATION

- A. Coordinate any owner-specific labeling scheme prior to installation.

## PART 2 - PRODUCTS

### 2.1 HORIZONTAL CABLE LABELS AND LABELING

- A. Cable labels shall be vinyl substrate with white background area and black print with clear tails that self laminates the printed area when wrapped around cable.
- B. Cable labels shall be machine or laser printer type.
- C. Faceplate labels shall be insert type labels used with clear plastic cover that secures the label from unauthorized access.
- D. Approved Label manufactures: Hubbell, Leviton, Panduit, Ortronics, Brady, Ideal or Thomas & Betts.

### 2.2 BACKBONE CABLE LABELS AND LABELING

- A. Labels shall be provided for all backbone cable types. Labels shall be installed within 2" to 6" of the termination point.
- B. Cable labels shall be white with a translucent tale that will wrap around the cable a minimum of two times.
- C. Cable labels shall be self-laminating vinyl with a white matte finish and black lettering.
- D. Cables labels shall be a minimum of 1.75" wide allowing a minimum 40 characters per line.
- E. Approved label manufacturers: Hubbell, Leviton, Panduit, Brady, Ideal or Thomas & Betts

### 2.3 EQUIPMENT ROOM LABELING

- A. Comply with TIA/EIA-606-C and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Each equipment cabinet/rack will be labeled with ER/TR and Rack Number. Labels shall be 5 inches long and 1 1/2 inches high with a white background and 5/8" black letters. Labels shall be centered on the top of the cabinet door or centered on the top frame of the Relay Rack. All Cabinets/racks shall be labeled.
- C. Labels shall be preprinted or laser printed type with self adhesive backing with excellent abrasion and smudge resistance, excellent water and oil resistance, self-extinguishing and self-laminating.
- D. Each patch panel, regardless of port density, shall be labeled with an alpha identifier beginning with A consecutively through the last patch panel in the cabinet/rack. Labels shall be 1"H x 1 1/2"W with 5/8"

black letters on a white matte background. Patch panel labels shall be centered on the left side of the panel.

- E. Approved Label Manufacturers: Leviton, Panduit, Ortronics, Brady, Ideal or Thomas & Betts.

## 2.4 GROUNDING LABELS

### A. LABELING

1. Label the TEBCs consecutively within each closet TEBC-01 through TEBC-xx with "xx" representing the last number in order.
2. Label all TGBs and the TMGB with the following:

**WARNING!!!**  
**IF THIS CONNECTOR OR CABLE IS**  
**LOOSE OR MUST BE REMOVED**  
**PLEASE CALL THE**  
**TELECOMMUNICATIONS MANAGER**

## PART 3 - EXECUTION

### 3.1 LABELING REQUIREMENTS

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-C. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  1. Administration Class: 2.
  2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion about TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-C for Class 2 level of administration.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- E. Cable and Wire Identification:
  1. Label each cable between 2 and 6 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.

3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 25 feet.
  4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    - a. Individually numbered wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
    - b. Label each unit and field within distribution racks and frames.
  5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-C, for the following:

END OF SECTION 270510



## SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS

### 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.
- B. Related Sections:
  - 1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
  - 2. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.

#### 1.2 SUMMARY

- A. This Section specifies technology equipment room fittings including the following:
  - 1. Telecommunications mounting backboards.
  - 2. Telecommunications equipment racks and cabinets.
  - 3. Telecommunications cable management.
  - 4. Telecommunications power devices.
- B. All work shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials.
- C. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.
- D. The Contractor must demonstrate to the Owner and Engineer that the systems are complete and complies with all operational requirements set forth in the plans and specifications.
- E. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.
- F. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the Engineer.
- G. SCOPE OF WORK
  - 1. Provide complete technology room fittings as indicated herein and on plans. Installation shall comply with latest EIA/TIA and BICSI Standards. Cabling infrastructures shall include all cabinets/racks and accessories, UPS units, surge strips, vertical power strips, cable ladder, cable

management, supplemental conduits, fire-stopping, and all other items necessary for a complete standards compliant installation.

### 1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Cable Ladder: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- C. LAN: Local area network.
- D. RCDD: Registered Communications Distribution Designer.
- E. ER: Technology Equipment Room.
- F. TR: Technology Room.

### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets on all system components. Data sheets shall be neatly bound with title page, index/bill of materials, and tab dividers for each major section. If multiple products or configurations are shown on the same product document, the product and or configuration to be supplied and installed on this project shall be highlighted.
- B. Specification sheets shall be submitted on all items including cables types.
- C. Submit as a separate section in the submittal book, a valid certificate from the equipment manufacturer verifying completion of Installation and Service Training by at least one (1) technician that will be working on the project consistently, and a proof of Authorized Dealer Status including ability to offer a full warranty for the system being installed.
- D. Submit as a separate section of the submittal book, resumes of the key staff assigned to this project, including the project RCDD and BICSI Level II technician, listing their experience and qualifications including a statement of the contractor's qualifications and abilities. Provide detailed information showing how the contractor will provide engineering, CADD support, fabrication and testing of equipment prior to delivery to job site, and service after installation is complete.
- E. The format and details for the submittals shall include the following:
  - 1. A complete bill of materials listing the following:
    - a. Applicable section/paragraph number from the project specification.
    - b. Manufacturer's name, model number (shall match spec sheet) and product description.
  - 2. Specification sheets for all equipment used on the project shall be inserted in the same chronological order as appearing in the specifications. Pages printed or copied from the web page or instruction manuals will not be accepted.

F. AutoCAD Shop Drawings: For technology room fittings:

1. Provide floor plans showing the locations of equipment cabinets, racks, ladder racking, wall mounted equipment and grounding bus bars. AutoCAD drawings shall include the product model name and part number as described on the product cut sheets. Generic Drawings will not be accepted.
2. Provide an enlarged elevation of the submitted products installed in equipment cabinets and/or data racks. AutoCAD drawings shall include the product model name and part number as described on the product cut sheets. Generic Drawings will not be accepted.
3. Provide detailed wall elevations showing wall mounted equipment assemblies, ladder rack mounting heights and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. AutoCAD drawings shall include the product model name and part number as described on the product cut sheets
4. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections. AutoCAD drawings shall include the product model name and part number as described on the product cut sheets
5. Grounding: Indicate location of grounding bus bars and its mounting detail showing standoff insulators and wall mounting brackets along with TBB routing locations.
6. All AutoCAD submittal drawings shall show the products presented in the product cut sheets. Generic drawings will be rejected.

G. Shop Drawings, Manufacture/contractor/technician certificates and BICSI certificates and product cut sheets shall be submitted together as one complete submittal package. Only complete submittal packages will be accepted for review and approval. Any partial submittals shall be returned as rejected.

H. Refer to Division 1 for any additional requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as an RCDD to perform the on-site inspection.

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. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-D.

D. Grounding: Comply with ANSI-J-STD-607-C.



## 1.6 COORDINATION

- A. Coordinate layout and installation of communications equipment with telecommunications and LAN equipment and the Owner's service providers. Coordinate service entrance arrangement with local exchange carrier.
  - 1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
  - 2. Record agreements reached in meetings and distribute them to other participants.
  - 3. Adjust arrangements and locations of equipment in technology rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
- B. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

## 1.7 WARRANTY

- A. Provide a 3-year parts and labor warranty.

## PART 2 - PRODUCTS

### 2.1 GENERAL

The following sections list materials and products acceptable for this project. Bidders may submit other products for consideration as equals by sending a request to the Engineer in writing no less than 10 days prior to the bid date. Include manufacturer cut sheets and any other information required to evaluate requested substitution. If the proposed substitution is accepted, it will be added by addendum, allowing all bidders the option to use that equipment. ITEMS NOT SPECIFICALLY ADDED BY ADDENDUM WILL NOT BE ACCEPTED.

### 2.2 PLYWOOD BACKBOARDS

- A. As shown on the enlarged plans, provide AC grade 3/4" x 8' void free plywood mounted vertically on the wall. Plywood shall be painted on all six sides with gray fire retardant paint. The top of the plywood shall be mounted at 8'6" unless noted otherwise.
- B. The plywood shall be securely anchored (Tapcon fasteners are not accepted) to the wall.
  - 1. In new hollow wall construction, solid blocking shall be installed and the plywood shall be fastened to the solid blocking with steel screws.
  - 2. In existing hollow wall construction, toggle bolts shall be used to fasten the plywood to the wall.
  - 3. Steel expansion anchors shall be used to fasten plywood to solid concrete walls.

### 2.3 RELAY RACKS & VERTICAL CABLE MANAGEMENT

- A. All structured cabling terminating in the ER shall be installed in 4 post relay racks.
- B. Relay racks shall be constructed of 6063-T2 aluminum with a durable black powder coat finish. When properly secured to the floor the racks shall have a 500 lbs. (static) weight capacity.

- C. Relay racks shall be UL-7N69 listed and have EIA-310-D universal spacing tapped #12-24 front and rear.
- D. Relay racks shall be secured to closet floor using Manufacture suggested installation anchors and closet ladder rack using a runway standoff bracket kit.
  - 1. Standoff bracket kit shall be installed to stabilize the data rack to the closet ladder rack.
  - 2. The standoff bracket kit shall include a data rack top plate and adjustable brackets.
  - 3. Standoff kit shall be black powder coat finish.
- E. Design Basis Two Post 7' Relay Rack – Hubbell HPW84RR19, Middle Atlantic RLA19-1245B, Ortronics OR-19-84-6T2SD or Chatsworth 46353-703.
- F. Design Basis Four Post 7' Relay Rack – Hubbell SF841936T, Middle Atlantic R412-4524B, Ortronics OR-MM20836ADJ12-X or Chatsworth 50120-A03
- G. Relay racks shall be equipped with 12” wide vertical cable management as shown on the detail plans. Covers on both the front and rear shall be hinged with a durable black powder coat finish.
- H. Design Basis 12” Vertical Organizer –Ortronics OR-DVMS706 or Chatsworth 35524-E03, or equals by Middle Atlantic CK-45, and Hubbell VM618.
- I. Relay racks shall be equipped with 6” wide vertical cable management as shown on the detail plans. Covers on both the front and rear shall be hinged with a durable black powder coat finish.
- J. Design Basis 6” Vertical Organizer – Ortronics OR-DVMS706 or Chatsworth 35524-E03, or equals by Middle Atlantic CK-45, and Hubbell VM618.
- K. Design Basis Stand-off Brackets: Chatsworth mounting plate 10595 with mounting bracket 10506-706; Hubbell Mounting Kit HLMPK19D with elevation kit HLX1518G or Cooper B-Line top plate SB213312FB and off bracket SB227x6FB.

## 2.4 ENCLOSED CABINETS

- A. All structured cabling terminating in the main equipment room (ER) shall be installed in fully enclosed cabinets. Cabinet enclosures shall be fully enclosed cabinets designed for mounting servers and data electronics. Cabinets shall have locking perforated steel reversible front doors, locking ventilated steel split rear doors, and removable side panels.
- B. Cabinet frames shall be of steel construction and designed for ganging multiple units together to form a multi cabinet bay. Cabinets shall have front and rear mounting rails which shall be EIA standard 19” width. Front rails shall be recessed to allow cables to pass from one cabinet to another via wire management accessories. Cabinets shall be provided with a 320 CFM (minimum) exhaust fan integrated into the top cover.
- C. Cabinets shall have leveling feet, vertical wire management channels, side panels, split vented rear doors, vented front door and cable entry glands at the top rear of the rack of sufficient size to accommodate all of the cables entering and exiting the rack plus 100% spare capacity. Cabinet minimum dimensions are 24” wide, 34” deep, and 84” tall with a white finish.

- D. Each cabinet shall contain horizontal wire management as shown on the cabinet elevations. Horizontal wire management shall contain removable solid front covers.
- E. Provide 19" vented stationary and sliding shelves as shown on the cabinet elevations. Shelves shall be from the same manufacture as the equipment cabinets.
- F. Design Basis 19" Steel Frame Cabinet – Chatsworth Teraframe FF3J-113B-C22B, Great Lakes GL840E-2436 with TPE-29F10 or Middle Atlantic DRK 19-44-36 (with DLVFD-44 front door, SPN-44-36 side panels and MW-10FT-550CFM).
- G. Design Basis Vertical Cable Management – Great Lakes VLB-8436, Chatsworth 40100-703, or Middle Atlantic CC 44 36.

## 2.5 WALL MOUNT SWING OUT ENCLOSURE

- A. Wall mounted swing out enclosure shall be installed where shown on the drawings.
- B. Enclosure shall have a solid lockable door with 19" adjustable mounting rails and a UL support listing of up to 200 lbs.
- C. Enclosure shall be a minimum 25 rack units high, with 30" minimum depth and 26" minimum width in a black powder finish.
- D. Enclosure shall have a 4" exhaust fan and a 19" vertical power strip.
- E. Approved Wall Mount Swing Out Enclosure: Chatsworth 11996-748, Hubbell HSQ4826 or Middle Atlantic CWR-26-32PD.
- F. Approved Exhaust Fan – Chatsworth 12804-701, Great Lakes 7217WS or Middle Atlantic CWR-FKIT.
- G. Approved Power Strip – Chatsworth 12820-701, Great Lakes 7219 or Middle Atlantic PD-920R.

## 2.6 CABLE LADDER

- A. In each ER and/or TR provide cable ladder above the cabinet/rack assemblies and on the backboard as shown on the drawings.
- B. Cable ladder shall be powder coated white or gray and constructed of 3/8" x 1-1/2" tubular steel. Cross members shall be welded at 12" intervals.
- C. Design Basis 18" Cable Ladder – Hubbell HLS1018G, Chatsworth 10250-E18 or Cooper B-Line SB17U18BTG.
- D. Design Basis 12" Cable Ladder – Hubbell HLS1012G, Chatsworth 10250-E12 or Cooper B-Line SB17U12BTG.
- E. Cable ladder shall be wall-mounted where possible using steel, triangular support brackets. For installations requiring the cable ladder to be installed away from the wall, provide center supports attached to the structural ceiling. Regardless of support method, the cable ladder shall be supported every five feet.

- F. Design Basis Triangular Support – Hubbell HLTSB18G, Chatsworth 11746-E18 or Cooper B-Line SB21318KTG.
- G. Design Basis Center Support Kit – Hubbell HLCMK, Cooper B-Line SB2118DBZ or Chatsworth 10607-002.
- H. Provide radius drops, radius bends, splice kits, corner brackets and all additional hardware required for a complete system.
- I. Design Basis 18” Radius Drops – Hubbell HLCD18, Cooper B-Line SB2129U18FB or Chatsworth 12100-718.

## 2.7 HORIZONTAL CABLE MANAGEMENT

- A. Provide horizontal cable organizers as shown on the Rack/Cabinet Elevations.
- B. Cable organizers shall have a black powder coat finish and be constructed of 16 ga. steel, provide seven management rings, six pass through holes, have a front ring depth of 3.5” and have a hinged front cover.
- C. Design Basis 1RU Cable Organizers – Hubbell HM14C, Chatsworth 30139-719, Cooper B-Line SB87019S1FB, OrtronicsOR-808000010, or Panduit CMPH1 with cover CMPH1C.
- D. Design Basis 2 RU Cable Organizers – Hubbell HM24C, Chatsworth 30130-719, Cooper B-Line SB87019S2FB, Ortronics OR-808044508, or Panduit CMPH2 with cover CMPH2C.

## 2.8 POWER DEVICES- 2KVA / 2.2KVA UPS SYSTEM

- A. As shown on the cabinet elevations, provide rack-mounted 2200VA, on-line, double conversion, UPS system(s) with a minimum of five (5) NEMA 5-20R outlets on rear of each. Connect to power outlet in each cabinet and relay rack.
- B. Input power: 120V, NEMA 5-20P.
- C. Provide a 2 year manufacturer’s warranty.
- D. Provide each UPS unit with a network management card installed in the optional interface slot. Connect the management card to the nearest 10/100 data port located within the cabinet.
- E. Design Basis UPS Unit – TRIPP-LITE SU2200RTXL2UA, Liebert GXT3-2000RT120, or Eaton 9130.
- F. Provide Network Management Card for each UPS from the same manufacturer.
- G. UPS units for different technology systems (data, voice, CCTV, sound, etc.) or of different sizes shall all be from the same manufacturer.
- H. In all enclosed cabinets and relay racks provide a vertical power strip mounted to the rear mounting rail and connected to the provided UPS.
- I. Power strips shall provide (1) one 20 amp/120 volt circuit with (10) ten NEMA 5-20P outlets.
- J. Design Basis Vertical Power Strip – Hubbell PR10420; Chatsworth 12850-705 or Lowell ACS-2012.

## 2.9 POWER DEVICES- LARGE (5KVA) UPS SYSTEM

- A. Provide a 5000VA/4000 watt double conversion UPS system with a NEMA L14-30P input connection and a minimum of 4 NEMA 5-20R output connectors to support the emergency requirements of the Data communications Core Switch, Network Server and other specialty equipment cabinets as shown on the drawings. Connect to power outlet in the cabinet.
- B. Provide a 2 year manufacturer's warranty.
- C. Provide each UPS unit with a network management card installed in the optional interface slot. Connect the management card to the nearest 10/100 data port located within the cabinet.
- D. Design Basis UPS Unit – TRIPP-LITE SU5000RT4U, Liebert GXT3-5000RT208-PD003, or Eaton 9PX5KP1.
- E. Provide Network Management Card for each UPS from the same manufacturer.
- F. In all enclosed cabinets and relay racks provide a vertical power strip mounted to the rear mounting rail and connected to the provided UPS.
- G. Power strips shall provide (1) one 20 amp/120 volt circuit with (10) ten NEMA 5-20P outlets.
- H. Design Basis Vertical Power Strip – Hubbell PR10420; Chatsworth 12850-705 or Lowell ACS-2012.

## 2.10 LABELING

- A. Requirements are provided in 270510 Telecommunications Administration and Labeling.

## PART 3 - EXECUTION

### 3.1 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping". Comply with TIA/EIA-569-D, Annex A, "Firestopping."

### 3.2 GROUNDING

- A. Ground all metallic equipment in accordance with ANSI-J-STD-607-C.
- B. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.
- C. Refer to Section 270500 for additional grounding requirements.

### 3.3 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-C. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- B. Requirements are provided in 270510 Telecommunications Administration and Labeling

- C. Labels shall be preprinted or computer-printed type.

3.4 CLOSE OUT DOCUMENTATION

- A. In addition to the requirements described in Section 27 01 00 Operations and Maintenance of Communication Systems, the installer shall provide a final AutoCAD drawings of the ER and TR's room layout detailing the location of wall mounted equipment, cabinet or rack locations, the routing of the ladder rack, the location of the grounding bus bars and the rack or cabinet elevations of the installed equipment.

END OF SECTION 271100



## SECTION 271300 – COMMUNICATIONS BACKBONE CABLING

### 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.
- B. Related Sections:
  - 1. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.
  - 2. Division 27 Section "Communications Equipment Room Fittings for Structured cabling equipment cabinets, relay racks and cable ladder.

#### 1.2 SUMMARY

- A. This Section specifies communications backbone equipment including the following:
  - 1. UTP cabling.
  - 2. Optical Fiber cabling.
  - 3. Coaxial cable.
  - 4. Connecting hardware, patch panels, and cross-connects.
- B. All work shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials.
- C. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.
- D. The Contractor must demonstrate to the Owner and Engineer that the systems are complete and complies with all operational requirements set forth in the plans and specifications.
- E. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.
- F. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the Engineer.
- G. SCOPE OF WORK
  - 1. The backbone cabling system shall consist of Cat-3 multi-pair copper cables, multimode and single mode fiber optic cables, RG-11U cables and Cat-6 tie lines between the Technology Control Center (ER) and the associated Technology Rooms (TRs).



2. Data and voice backbone cables shall be installed in the corridor cable tray and associated wall sleeves between the Technology Control Center (ER) and the associated Technology Room (TR).
3. Coaxial backbone cables shall be installed in an independent J-hook system between the Technology Control Center (ER) and the associated Technology Room (TR).

### 1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- C. EMI: Electromagnetic interference.
- D. IDC: Insulation displacement connector.
- E. LAN: Local area network.
- F. RCDD: Registered Communications Distribution Designer.
- G. UTP: Unshielded twisted pair.
- H. OTDR: Optical Time Domain Reflectometer
- I. ER: Technology Equipment Room.
- J. TR: Technology Room.

### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Submit manufacturer's data sheets on all system components. Data sheets shall be neatly bound with title page, index/bill of materials, and tab dividers for each major section. If multiple products or configurations are shown on the same product document, the product and or configuration to be supplied and installed on this project shall be highlighted. Highlight or otherwise indicate all required accessories specified to be included with product being submitted.
  1. For cables, include the following installation data for each type used:
    - a. Nominal OD.
    - b. Minimum bending radius.
    - c. Maximum pulling tension.
- C. Submit as a separate section of the submittal book, resumes of the key staff assigned to this project including the RCDD and BICSI level II technician listing their experience and qualifications including a statement of the contractor's qualifications and abilities. Provide detailed information showing how the

contractor will provide engineering, CADD support, fabrication and testing of equipment prior to delivery to job site, and service after installation is complete.

D. The format and details for the submittals shall include the following:

1. A complete bill of materials listing the following:
  - a. Applicable section/paragraph number from the project specification.
  - b. Manufacturer's name, model number (shall match spec sheet) and product description.
2. Manufacturer's data sheets for all equipment used on the project shall be inserted in the same chronological order as appearing in the specifications. Sales brochures or other documentation that do not include performance specifications will not be accepted.

E. Shop Drawings:

The contractor shall provide AutoCAD drawings detailing the information described below:

1. System Labeling Schedules: Electronic copy of labeling schedules in format approved by Owner.
  2. Cabling administration drawings and printouts.
  3. Wiring diagrams to show typical wiring schematics including the following:
    - a. Cross-connects.
    - b. Patch panels.
    - c. Patch cords.
  4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
- F. Shop Drawings: Submit AutoCAD layout drawings, detailing the pathway installation of all backbone cable types on 1/8" = 1' scale floor plans 30"x42" (standard "E" size) sheets.
- G. Provide a separate AutoCAD drawing showing an enlarged fiber optic interconnect center and the termination ports of the multimode and single mode fiber optic cables. Provide labeling scheme for each fiber optic cable type.
- H. Provide a separate AutoCAD drawing showing an enlarged 110 termination wall field for each ER/TR's showing the labeling format for each terminated pair.
- I. Provide a separate AutoCAD drawing showing enlarged Cat 6 backbone patch panels and the labeling scheme associated with the TIE cables.
- J. Drawings shall show all interconnections between the building cabling, infrastructures, overall system connections, cable and connector types, cable labeling schemes, backboard layouts including cable pathways, all dimensions between termination blocks and equipment mounted to the backboard, and connections between major hardware components. Submit wiring diagrams showing typical connections for all equipment.
- K. Drawings shall detail the product name and part number of the materials provided in the product cut sheets. Generic drawings will not be accepted.

- L. Shop drawings shall be submitted together with product submittals as one complete submittal. Only complete submittals will be accepted for review and approval. Any partial submittals will be rejected.
- M. Refer to Division 1 for any additional requirements.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
  - 1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of an RCDD.
  - 2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
  - 3. Field Inspector: Currently registered by BICSI as an RCDD to perform the on-site inspection.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index.
  - 2. Smoke-Developed Index.
- C. 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.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-D.
- E. Grounding: Comply with ANSI-J-STD-607-C.

#### 1.6 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

#### 1.7 WARRANTY

- A. Provide a 20-year parts and labor warranty.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. The following sections list materials and products acceptable for this project. Bidders may submit other products for consideration as equals by sending a request to the Engineer in writing no less than 10 days prior to the bid date. Include manufacturer cut sheets and any other information required to evaluate requested substitution. If the proposed substitution is accepted, it will be added by addendum, allowing all bidders the option to use that equipment. **ITEMS NOT SPECIFICALLY ADDED BY ADDENDUM WILL NOT BE ACCEPTED.**

## 2.2 UTP BACKBONE

### A. CATEGORY-3 CABLE (D-Mark Extension)

1. Copper backbone cables shall be plenum rated and consist of 24-gauge, Category-3, twisted solid copper conductors individually insulated and sheathed and shall be used for backbone runs between TR rooms and the ER and from the service entrance to the ER. The minimum pair count to be installed is a 50-pair cable. Higher pair count cables can be used as long as the minimum pair count is provided.
2. Category-3 backbone cables shall be UL verified to meet all requirements of TIA 568.2-D
3. At a minimum, the Category-3 backbone cables shall have the following electrical specifications:
  - a. DC Resistance: 9.38 ohm/km maximum.
  - b. Resistance Unbalance: 5% maximum.
  - c. Delay Skew: 45ns/100m maximum.
  - d. Maximum Attenuation @ 16 MHz: 13.1 dB/100m.
  - e. Minimum SLR @ 16 MHz: 10 dB/100m.
  - f. Characteristic Impedance: 100 ohms +/- 15 @ 1 to 1000 MHz.
4. Approved Category-3 backbone cable manufacturers shall be a warranty partner for the structured cabling connectivity manufacturer provided in Section 271500 "Communications Horizontal Cabling".
5. Category 3, Plenum cable manufacturers are Superior Essex, Berk-Tek 10032112, Mohawk M56126, Belden DPLN50, and General Cable 2131505,.
6. Unless noted or specified otherwise, at a minimum, the pair count shall be four pairs for each voice outlet provided, plus an additional 30% for future growth. Terminate four pairs per patch panel port and coil the 25<sup>th</sup> pair.

### B. 110 WALL BLOCKS

1. Provide 100 pair 110 wall blocks for termination of Category-3 backbone cables on the plywood backboard in the ER. Provide a minimum of one (1) 110 block for carrier cross-connect.
2. 100 pair 110 blocks shall be tested and verified to meet and exceed Category-5e ANSI/TIA 568.2-D connecting hardware specifications to support both high-speed data and voice applications.
3. 110 wiring bases and blocks shall be made of fire-retardant plastic rated UL 94V-0.
4. 100 pair 110 wall blocks shall include mounting frame, vertical and horizontal cable management, four pair or five pair connector blocks, clear label holders, and white designation strips. 100 pair 110 tower wall blocks shall be securely mounted to plywood backboards.
5. Design Basis – 100 Pair 110 Wall Blocks – Siemon S110AA@-100FT Hubbell SpeedGain CrossConnect System 110, Belden Cable Management AX10069X-S series, Leviton 41AB2 Series, or Ortronics 110 Wiring Block with Legs. Provide label strips, cable management, C-5 and C-4 clips compatible with 110 block series. Manufacturer provided shall match the one provided in Section 271500 "Communications Horizontal Cabling".

C. UTP PATCH PANELS

1. Category-3 UTP backbone cables shall terminate at the ER and TRs in an 8-pin, Cat-6, RJ45 connector with TIA-568B wiring configuration in a high density patch panel.
2. Category-6 UTP backbone cables shall terminate at the ER and TRs in an 8-pin, Cat-6, RJ45 connector with TIA-568B wiring configuration in a high density patch panel.
3. Patch panels shall be 48-port maximum to allow installation of wire managers above and below panel for organized patching.
4. Patch panels shall contain rear cable management bracket for guiding cables and providing strain relief at connection. Patch panels shall contain labeling fields above outlets.
5. All module ports on the patch panels shall be filled with Cat-6 modular outlets.
6. Separate patch panels shall be provided for Cat-3 and Cat-6 backbone cables in the quantities shown on the Rack/Cabinet elevations.
7. Design Basis UTP Patch Panel: Hubbell HP624 (24-Port) or HP648 (48-port). Equal products by Ortronics PHD66U24 (24-port) or PHD66U48 (48 port), Belden Cable Management AX103253 (24-port) or AX103255 (48-port), and Leviton 69586-U24 (24-port) or 69586-U48 (48-port). Manufacturer provided shall match the one provided in Section 271500 "Communications Horizontal Cabling".

D. CATEGORY-6 UTP CABLE

1. All Cat-6 backbone cabling shall be Category-6 UTP, 4 Pair, 23/24 AWG, solid conductor cable and shall be used for backbone runs between TR rooms and the ER and from the service entrance to the ER.
2. The cable jackets shall be clearly marked from the factory indicating the Category listing, plenum rating, and linear footage of cable from spool.
3. The 4 pair UTP cable shall be UL<sup>®</sup> and c (UL<sup>®</sup>) Listed Type CMP (plenum).
4. The Category 6 cabling shall meet the Cat6 *minimum* standards as listed by ANSI/TIA.

Freq (MHz)	Attn Standard (dB)	NEXT Standard (dB)	PS NEXT Standard (dB)	ELFEXT Standard (dB)	PS ELFEXT Standard (dB)	Return Loss Standard (dB)
0.772	1.8	76.0	74.0	70.0	67.0	‡
1	2.0	74.3	72.3	67.8	64.8	20
4	3.8	65.3	63.3	55.7	52.7	23.0
8	5.3	60.8	58.8	49.7	46.7	24.5
10	6.0	59.3	57.3	47.8	44.8	25.0
16	7.6	56.2	54.3	43.7	40.7	25.0
20	8.5	54.8	52.8	41.7	38.7	25.0
25	9.5	53.3	51.3	39.8	36.8	24.3
31.25	10.7	51.9	49.9	37.9	34.9	23.6
62.5	15.4	47.4	45.4	31.8	28.8	21.5
100	19.8	44.3	42.3	27.8	24.8	20.1
200	29.0	39.8	37.8	21.7	18.7	18.0
250	32.8	38.3	36.3	19.8	16.8	17.3

‡ Not Specified

5. Approved Category-6 backbone cable manufacturers are Superior Essex Cat 6 CMP series, Berk-Tek Lanmark 6 series, Mohawk 6 LAN series, Belden 2413 series or General Cable GenSpeed 6 series. Manufacturer provided shall match the one provided in Section 271500 “Communications Horizontal Cabling”.

2.3 OPTICAL FIBER BACKBONE

A. MULTIMODE BACKBONE FIBER OPTIC CABLING – NON-ARMORED

1. All multi-mode fiber optic cabling shall be 50/125um OM4 laser optimized, tight-buffered, OFNP-rated (plenum rated) fiber and shall be used for backbone runs between TR rooms and the ER and from the service entrance to the ER.
2. All multimode fiber shall be OM4 aqua or Erika Violet in color. The cable jackets shall be clearly marked from the factory indicating the fiber type and plenum rating.
3. The 50 micron MM fiber shall support single-channel serial transmission, in both the building riser and campus backbones, to 10 gigabits per second (Gb/s) for a distance of 550 meters at 850nm with 4 connections.
4. The 50 micron MM fiber shall be laser enhanced and support 10 Gigabit transmissions with a minimum bandwidth of 4700MHz-km at 850nm.
5. The 50 micron fiber shall be backward compatible with legacy applications such as: Ethernet, Token Ring, FDDI, Fast Ethernet and ATM (for in-building network distances).
6. Fiber shall support 10 Gb/s short wavelength (850 nm) applications using vertical cavity surface emitting lasers (VCSELs) and low bit rate LED applications for legacy systems.
7. The 50 micron fiber shall be optimized to control differential mode delay (DMD) so that “pulse splitting” at 10 Gb/s is eliminated.
8. The 50 micron fiber shall meet or exceed the following standards, as applicable, for OSP or Plenum cables: ICEA S-83-596, ISO/IEC-794, ISO 11801, GR-409, EIA/TIA 455, EIA/TIA 492, EIA/TIA 568.3-D, ANSI-FDDI, IEEE 802, UL 910, OFNP classification as described in the National Electric Code (NEC2), OFN-LS Low Smoke Cables, CSA Certified (OFN FT4/FT6) and approved component industry standards.
9. The 50 micron multimode plenum building backbone fiber shall meet the following technical specifications.

Optical fiber	50 micron multimode (10 Gigabit)
Fiber dimension	125 micron cladding 250 micron coating 900 micron tight buffering
Fiber proof stress	100 kpsi (689 N/mm <sup>2</sup> )
Fiber core	50 μm (±2 μm)
Core non-circularity	< 6%
Core/cladding concentricity error	< 3.0 μm
Numerical aperture	0.200 +0.015/-0.010
Cladding diameter	125 μm (± 1 μm)
Cladding non-circularity	< 2%
Colored fiber diameter	250 μm (± 15 μm)
Buffering diameter	890 mm (± 50 mm)
Minimum tensile strength	100,000 psi
Fiber minimum bending radius	0.75 inch (1.19 cm)

Cable minimum bending radius	20 times cable diameter during installation 10 times cable diameter after installation
Maximum fiber loss	3.5 dB/km at 850 nm 1.5 dB/km at 1300 nm
Minimum Bandwidth	1500 MHz-km at 850 nm (overfilled) 500 MHz-km at 1300 nm (overfilled) 500 MHz-km at 1300 nm (laser) 4700 MHz-km at 850 nm
Fiber identification	Individually color coded buffering
Buffer material	Plenum – Low Smoke PVC Color Coded
Jacket material	Plenum – Low Smoke PVC Aqua or Erika Violet Color
Strength material	Aramid yarn
Operating temperature	(0dB added) -4°F to + 158°F (-20°C to +70°C)
Operating temperature	(less than 1.0dB added) -40°F to + 185°F (-40°C to +85°C)
Storage temperature	-40°F to + 158°F (-40°C to +70°C)

10. Multi-mode fiber shall be provided with six strands per 48 switch ports plus 12 spare strands per TR, with a minimum of 24-strands per TR provided.
11. Approved Multi-Mode Fiber Optic Cable Products: Superior Essex TeraGain "F" series, Mohawk FI4DXXXPX series, Berk-Tek PDP Series (Premises Distribution Plenum) or General Cable BLXXX1PNU/P1D series.

**B. SINGLE-MODE BACKBONE FIBER OPTIC CABLING – NON-ARMORED**

1. All single-mode fiber optic cabling shall be tight-buffered 8.7/125um OS2, OFNP (plenum rated), and shall be used for backbone runs between TR rooms and the ER and from the service entrance to the ER. All single-mode fiber shall be yellow in color.
2. The cable jackets shall be clearly marked from the factory indicating the fiber type and plenum rating.
3. The single mode plenum building backbone fiber shall meet the following physical specifications.

Fiber Attribute (Depressed Cladding)
Cladding Diameter: 125.0 ± 1.0 µm
Cladding Non-Circularity: ≤ 1.0%
Colored Fiber Diameter: 250 ± 15 µm
Core Diameter: 8.3 µm
Core/Cladding Concentricity: ≤0.8 µm
Minimum Proof Strength: .70 Gpa (100 kpsi)
Fiber Curl: >2m
Fiber Macrobend (100 turns @ 32 mm diameter) ≥0.05 dB @ 1310 NM, ≥0.10 dB @ 1550 NM
Fiber Macrobend (1 turn @ 32 mm diameter) 0.5dB @ 1550m
Coating Strip Force: 1.3 N ≤ F ≤ 8.9 N
Dynamic Tensile Strength (Unaged):>55kpsi (3.8 Gpa)
Dynamic Tensile Strength (aged):>440kpsi (3.0 Gpa)

Dynamic Fatigue: >20
Static Fatigue: >20

4. The single mode plenum building backbone fiber shall meet the following optical specifications.

Index of Refraction: 0.37%
Mode Field Diameter: $8.8 \pm 0.5 \mu\text{m}$ @ 1310 NM
Attenuation: 0.4 dB/km @ 1310 NM; 0.3 dB/km @ 1550 nm
Attenuation at Water Peak: 2.0 dB/km @ 1350nm
Point Discontinuities: 0.1 dB
Zero-Dispersion Wavelength: $1310 \pm 10 \text{ nm}$
Zero-Dispersion Slope: 0.092 ps/m <sup>2</sup> -km
Maximum Dispersion: 2.8 ps/NM-km, 1285 to 1330 NM
Fiber Cutoff Wavelength: $\geq 1150 \text{ NM}$ . $\geq 1300 \text{ NM}$
Cable Cutoff Wavelength: < 1260 nm

5. Minimum of 12 strands from the ER to each TR.  
 6. Approved Single Mode Fiber Optic Cable Manufacturers: Superior Essex 440XX3X01 series, Mohawk FISDXXXPX series, Berk-Tek Premises Distribution Plenum series or General Cable APXXX1PUN/P1D series.

C. MULTIMODE BACKBONE FIBER OPTIC CABLING - ARMORED

- All multi-mode fiber optic cabling shall be 50/125um OM4 laser optimized, tight-buffered, OFCP-rated (plenum rated) fiber and shall be used for backbone runs between TR rooms and the ER and from the service entrance to the ER.
- All multimode fiber shall be OM4 aqua or Erika Violet in color. The cable jackets shall be clearly marked from the factory indicating the fiber type and plenum rating.
- The 50 micron MM fiber shall support single-channel serial transmission, in both the building riser and campus backbones, to 10 gigabits per second (Gb/s) for a distance of 550 meters at 850nm with 4 connections.
- The 50 micron MM fiber shall be laser enhanced and support 10 Gigabit transmissions with a minimum bandwidth of 4700MHz-km at 850nm.
- The 50 micron fiber shall be backward compatible with legacy applications such as: Ethernet, Token Ring, FDDI, Fast Ethernet and ATM (for in-building network distances).
- Fiber shall support 10 Gb/s short wavelength (850 nm) applications using vertical cavity surface emitting lasers (VCSELs) and low bit rate LED applications for legacy systems.
- The 50 micron fiber shall be optimized to control differential mode delay (DMD) so that “pulse splitting” at 10 Gb/s is eliminated.
- The 50 micron fiber shall meet or exceed the following standards, as applicable, for OSP or Plenum cables: ICEA S-83-596, ISO/IEC-794, ISO 11801, GR-409, EIA/TIA 455, EIA/TIA 492, EIA/TIA 568.3D, ANSI-FDDI, IEEE 802, UL 910, OFNP classification as described in the National Electric Code (NEC2), OFN-LS Low Smoke Cables, CSA Certified (OFN FT4/FT6) and approved component industry standards.



9. The 50 micron multimode plenum building backbone fiber shall meet the following technical specifications.

Optical fiber	50 micron multimode (10 Gigabit)
Fiber dimension	125 micron cladding 250 micron coating 900 micron buffering
Fiber proof stress	100 kpsi (689 N/mm <sup>2</sup> )
Fiber core	50 μm (±2 μm)
Core non-circularity	< 6%
Core/cladding concentricity error	< 3.0 μm
Numerical aperture	0.200 +0.015/-0.010
Cladding diameter	125 μm (± 1 μm)
Cladding non-circularity	< 2%
Colored fiber diameter	250 μm (± 15 μm)
Buffering diameter	890 μm (± 50 μm)
Minimum tensile strength	100,000 psi
Fiber minimum bending radius	0.75 inch (1.91 cm)
Cable minimum bending radius	20 times cable diameter during installation 10 times cable diameter after installation
Maximum fiber loss	3.5 dB/km at 850 nm 1.5 dB/km at 1300 nm
Minimum Bandwidth	1500 MHz-km at 850 nm (overfilled) 500 MHz-km at 1300 nm (overfilled) 4700 MHz-km at 850 nm (laser)
Fiber identification	Individually color coded buffering
Buffer material	Plenum – Low Smoke PVC Color Coded
Jacket material	Plenum – Low Smoke PVC Aqua or Erika Violet Color
Strength material	Aramid yarn
Operating temperature	(0dB added) -4°F to + 158°F (-20°C to +70°C)
Operating temperature	(less than 1.0dB added) -40°F to + 185°F (-40°C to +85°C)
Storage temperature	-40°F to + 158°F (-40°C to +70°C)

10. Multi-mode fiber shall be provided with six strands per 48 switch ports plus 12 spare strands per TR, with a minimum of 24-strands per TR provided.
11. Approved Multi-Mode Fiber Optic Cable Products: Superior Essex TeraFlex "P" series, Mohawk FI4DXXXAX series, Berk-Tek PDPK Series (Premises Distribution Plenum w/ Interlocking Armor) or General Cable BLXXX1PNU/P1D-IPLA series.

**D. SINGLE-MODE BACKBONE FIBER OPTIC CABLING - ARMORED**

1. All single-mode fiber optic cabling shall be tight-buffered 8.7/125um OS2, OFCP (plenum rated), and shall be used for backbone runs between TR rooms and the ER and from the service entrance to the ER. All single-mode fiber shall be yellow in color.
2. The cable jackets shall be clearly marked from the factory indicating the fiber type and plenum rating.

3. The single mode plenum building backbone fiber shall meet the following physical specifications.

Fiber Attribute (Depressed Cladding)
Cladding Diameter: $125.0 \pm 1.0 \mu\text{m}$
Cladding Non-Circularity: $\leq 1.0\%$
Colored Fiber Diameter: $250 \pm 15 \mu\text{m}$
Core Diameter: $8.3 \mu\text{m}$
Core/Cladding Concentricity: $\leq 0.8 \mu\text{m}$
Minimum Proof Strength: .70 Gpa (100 kpsi)
Fiber Curl: $>2\text{m}$
Fiber Macrobend (100 turns @ 32 mm diameter) $\geq 0.05 \text{ dB @ } 1310 \text{ NM}$ , $\geq 0.10 \text{ dB @ } 1550 \text{ NM}$
Fiber Macrobend (1 turn @ 32 mm diameter) $0.5\text{dB @ } 1550\text{m}$
Coating Strip Force: $1.3 \text{ N} \leq F \leq 8.9 \text{ N}$
Dynamic Tensile Strength (Unaged): $>55\text{kpsi (3.8 Gpa)}$
Dynamic Tensile Strength (aged): $>440\text{kpsi (3.0 Gpa)}$
Dynamic Fatigue: $>20$
Static Fatigue: $>20$

4. The single mode plenum building backbone fiber shall meet the following optical specifications.

Index of Refraction: 0.37%
Mode Field Diameter: $8.8 \pm 0.5 \mu\text{m @ } 1310 \text{ NM}$
Attenuation: $0.4 \text{ dB/km @ } 1310 \text{ NM}$ ; $0.3 \text{ dB/km @ } 1550 \text{ nm}$
Attenuation at Water Peak: $2.0 \text{ dB/km @ } 1350\text{nm}$
Point Discontinuities: 0.1 dB
Zero-Dispersion Wavelength: $1310 \pm 10 \text{ nm}$
Zero-Dispersion Slope: $0.092 \text{ ps/m}^2\text{-km}$
Maximum Dispersion: $2.8 \text{ ps/NM-km}$ , 1285 to 1330 NM
Fiber Cutoff Wavelength: $\geq 1150 \text{ NM}$ . $\geq 1300 \text{ NM}$
Cable Cutoff Wavelength: $< 1260 \text{ nm}$

5. Minimum of 12 strands from the ER to each TR.  
 6. Approved Single Mode Fiber Optic Cable Manufacturers: Superior Essex L40XX3X01 series, Mohawk F1SDXXXPX series, Berk-Tek PDPK Series (Premises Distribution Plenum w/ Interlocking Armor) or General Cable APXXX1PUN/P1D-IPLA series.

E. FIBER OPTIC INTERCONNECT CENTERS

- Fiber optic interconnect centers shall provide capacity for the termination of all fiber optic cable strands utilizing “12-pack” adapter panels. Provide 2 spare panel openings in each interconnect center for future growth.
- Fiber optic interconnect centers shall allow for rear/side entry of backbone fiber for termination and front patching. Interconnect center shall contain a locking hinged Plexiglas front door with front and side cable openings for fiber patching extensions.
- Splice trays compatible with heat shrink sleeve protectors shall be provided to house and protect all fusion splices.

4. Fiber Optic Splice Shelves shall be provided for the storage of all splice trays. Splice Trays shall not be installed in the Fiber Optic Interconnect Centers. Fiber Optic splice shelves shall provide sufficient capacity to support up to 6-12 port splice trays and provide internal routing of the fiber optic strands to the fiber optic interconnect center.
5. Snap in adapters with 6 duplex LC connectors shall be provided. High density adapters that accommodate more than twelve strands of fiber will not be accepted.
6. Blank modules shall be provided to fill all unused openings.
7. Multi-mode connector shall be blue and single mode connectors shall be yellow.
8. Bend radius guides and looping brackets shall be provided concealed in rear of frames for management of fiber slack.
9. All single-mode fibers shall terminate in independent adapter modules from the multi-mode fiber adapters.
10. Approved Rack Mount Interconnect Centers: Siemon SWIC3-MNN-01, Hubbell Optichannel series, Ortronics Optimo FC0-xx-C, Leviton Opt-X Unity series, or Belden Cable Management FiberExpress Patch Panel series with Plexiglass front cover. Manufacturer provided shall match the one provided in Section 271500 "Communications Horizontal Cabling".
11. Interconnect centers shall be supplied with the following accessories: Fiber cable management, cable strain relief mounting kits, fusion splice sleeves, and splice tray with mounting hardware kit.
12. Provide adapter plates with six duplex LC connectors to match interconnect center supplied. Single-mode connections shall be blue, multimode connections shall be aqua, APC connections shall be green.
13. Manufacturer provided shall match the one provided in Section 271500 "Communications Horizontal Cabling".
14. Provide blank modules for all unused spaces from manufacturer of interconnect center.

F. FIBER OPTIC CONNECTORS

1. All fiber cables (Multimode and Single mode) shall terminate in "LC" type connectors utilizing fusion spliced factory pigtail termination kits. Provide dust covers for all connectors. Provide heat shrink sleeves for all fusion splices.
2. All fiber optic pigtails shall be from the same manufacturer as the fiber optic interconnect centers.
3. Pigtails shall be provided in sufficient quantity to terminate all strands in the fiber optic interconnect centers.
4. Multi-mode pigtails shall be 900 micron tight-buffered, laser optimized, 3 meters in length and have a simplex LC connector. Multimode insertion loss: < 0.5dB (0.25dB typical). Multimode return loss: better than -25dB. Minimum 50/125µm laser optimized fiber effective mode bandwidth: 2000 MHz-km @ 850nm. Mating durability: 500 matings per FOTP-21. Operating/storage temperature: -40°C to 75°C.
5. Single mode pigtails shall be tight-buffered, OS2, 3 meters in length and have a simplex LC connector. Singlemode insertion loss: < 0.35dB (0.15dB Typical). Singlemode return loss: better than -55dB. Mating durability: 500 matings per FOTP-21. Operating/storage temperature: -40°C to 75°C.

## 2.4 COAXIAL CABLE BACKBONE

### A. RG-11U CABLE

1. Type RG-11U cable shall be used for backbone runs between TR rooms and the ER and from the service entrance to the ER.
2. Minimum performance specifications shall be:
  - a. 14 AWG solid bare copper center conductor.
  - b. Foam FEP core insulation.
  - c. 100% aluminum/Mylar shield with 65% aluminum braid shield
  - d. Overall copolymer insulation.
  - e. Nominal DC resistance 2.6 ohms per 1000 feet.
  - f. Nominal capacitance of 16. pf/ft.
  - g. Nominal velocity of propagation 82%.
  - h. Attenuation per 100 feet (30.5 m) shall not exceed 5.5 dB at 1,000MHz.
  - i. 75 ohm nominal impedance.
3. All coaxial cables shall be factory sweep tested from 5 to 1000 MHz. Contractor shall sweep test all coaxial cables after installation and verify performance to 1000 MHz.
4. All coaxial cables shall be terminated with an appropriate single piece male "F" connector. Connectors with separate crimp rings will not be accepted. Connectors and installation tooling shall be approved by the cable manufacturer for use with the specified cable.
5. All coaxial video cabling shall be plenum rated and white in color.
6. Approved RG-11U Cable Manufacturers: Advanced Digital Cable, West Penn, General Cable, Mohawk, Belden .

## PART 3 - EXECUTION

### 3.1 COPPER BACKBONE REQUIREMENTS

- A. Provide 110 block adjacent to utility entrance terminal for cross-connection to utility circuits. Extend 50-pair to rack-mounted 24-port Cat-6 patch panel.
- B. Provide 50-pair Cat-3 backbone from ER to each TR. Terminate on wall-mount 110 blocks.
- C. Provide six (6) 4-pair Cat-6 cables between the ER and each TR. Terminate the cables on Cat-6 rack-mounted patch panels at each end.
- D. When Entrance Facility is not co-located in the Equipment Room (ER), provide a minimum of six (6) 4-pair Cat-6 cables and one (1) 50-pair Cat-3 cable between the Entrance Facility and the ER for the extension of special circuits (T-1, PRI, etc). Terminate the cables on Cat-6 patch panels at each end.
- E. Provide RG-11U coax backbone from ER to each TR. Terminate with compression F-connectors to coaxial feed-through wall mount patch panels at each end.

### 3.2 FIBER OPTIC BACKBONE REQUIREMENTS

- A. Provide multi-mode and single-mode fiber optic backbones between ER and each TR, and ER and Entrance Facility (EF).
- B. Multi-mode fiber shall be provided with six strands per 48 switch ports plus 12 spare strands per TR, with a minimum of 24-strands per TR provided.
- C. Minimum of 12 single-mode strands from the ER to each TR.
- D. Ground metallic shield of armored fiber cable to TGB in the ER.
- E. Provide 10' service loop at each end of the cable run.
- F. Dress and secure all fiber optic backbones using Velcro tie-straps.
- G. Provide grommets, strain relief, and bend radius guides at all fiber interconnect centers, ladder rack, and cable pathways.

### 3.3 WIRING METHODS

- A. Install cables in raceways and cable trays except within consoles, cabinets, desks and counters. Conceal raceway and cables except in unfinished spaces.
- B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Bundle, lace, and train cables within cabinets, racks and enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

### 3.4 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  - 1. Comply with TIA-568.1-D.
  - 2. Install 110-style IDC termination hardware unless otherwise indicated.
  - 3. Terminate all conductors; no cable shall contain un-terminated elements unless noted specifically on the plans. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
  - 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 48 inches and not more than 12 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
  - 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Use d-rings, j-hooks, lacing bars and distribution spools.
  - 7. 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.

8. Cold-Weather Installation: Bring cable to room temperature before unreeling. Heat lamps shall not be used for heating.
  9. In the technology equipment room (ER) and each technology room (TR), install a 20 foot long service loop on each end of cable. Service loop shall be stored in the cable tray installed along the perimeter of the room.
- C. UTP Cable Installation:
1. Comply with TIA-568.2-D.
  2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
- D. Optical Fiber Cable Installation:
1. Comply with TIA-568.3-D.
  2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.
- E. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  2. Suspend UTP cable not in a wireway or pathway, a minimum of 6 inches above ceilings, by cable supports not more than 48 inches apart.
  3. Cable shall not be run through structural members or in contact with pipes, ducts or other potentially damaging items.
- F. Separation from EMI Sources:
1. Comply with TIA-569-D recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
  2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 6 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
  3. Separation between communications cables in grounded metallic raceways 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.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways 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.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 6 inches.

### 3.5 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-D, Annex A, "Firestopping."

### 3.6 GROUNDING

- A. Comply with ANSI-J-STD-607-C.
- B. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.
- C. Refer to Section 270500 for additional grounding requirements.

### 3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-C. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  1. Administration Class: 2.
  2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion about TIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA-606-C for Class 2 level of administration.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable between 2 and 6 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 25 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
  - a. Individually numbered wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
  - b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606-C, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568.1-D.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP copper 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 meet or exceed applicable requirements in TIA-568.2-D. 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.
4. Optical Fiber Cable Tests:
  - a. Test instruments shall meet or exceed applicable requirements in TIA-568.1-D. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.



b. Link End-to-End Attenuation Tests:

- 1) Multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
- 2) Single mode backbone link measurements: Test at 1310 or 1550 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
- 3) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA-568.1-D.

- B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- C. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.9 CLOSE OUT DOCUMENTATION

- A. In addition to the requirements described in Section 27 01 00 Operations and Maintenance of Communication Systems, the installation contractor shall provide a separate tab identified as BACKBONE CABLING TEST RESULTS and a separate tab identified as MANUFACTURE WARRANTY. All backbone test results shall be presented for Engineer evaluation and included in the Manufacturer's Application and Performance Warranty and Inspections.
- B. Items mentioned in paragraph A above shall be presented with the contractor's final as-built drawings as a complete package. Only complete packages will be reviewed. Partial packages will be rejected.

END OF SECTION 271300

## SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

### 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.
- B. Related Sections:
  - 1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
  - 2. Division 27 Section "Communications Equipment Room fittings" for voice and data cabling associated with system panels and devices.

#### 1.2 SUMMARY

- A. This Section specifies communications horizontal cabling equipment including the following:
  - 1. UTP cabling.
  - 2. Coaxial cable.
  - 3. Connecting hardware, patch panels, and cross-connects.
  - 4. Outlets/connectors.
- B. All work shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials.
- C. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.
- D. The Contractor must demonstrate to the Owner and Engineer that the systems are complete and complies with all operational requirements set forth in the plans and specifications.
- E. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.
- F. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the Engineer.
- G. SCOPE OF WORK
  - 1. This Contractor must have five years minimum experience in data network wiring installations. This Contractor shall be a certified installer for the structured cabling solution utilized, and shall provide a minimum twenty (20) year extended Product and Applications Assurance warranty on parts and labor from the connectivity system manufacturer (certified contractor program); or

equivalent warranty by Hubbell, Ortronics, Leviton, or Belden/Mohawk. (Either Hubbell Mission Critical Certified, Ortronics Certified Installer, Leviton Network Premier Partner, or Belden Partner Alliance Warranty/Mohawk MAC Warranty.) Contractor shall be a certified installer for the manufacturer utilized.

2. Provide a complete data, video and voice cabling system as indicated herein and on plans. Cabling systems shall comply with latest EIA/TIA and BICSI Standards. Cabling infrastructures shall include all horizontal Cat6 data cabling, horizontal Cat6 voice cabling, horizontal RG-6U coaxial cabling, multimedia interface cabling, all associated modular station outlets and faceplates, all associated patch panels and outlets, supplemental conduits, fire-stopping, and all other items necessary for a complete standards compliant installation.

### 1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- D. Contractor: Organization or individual that contracts directly with the owner to furnish, install, service, and warranty the installation of this specification.
- E. EMI: Electromagnetic interference.
- F. IDC: Insulation displacement connector.
- G. Installer: The business or individual(s) which provides the labor to either the contractor or subcontractor under the terms specified in this contract.
- H. LAN: Local area network.
- I. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- J. RCDD: Registered Communications Distribution Designer.
- K. Sub-Contractor: The business or individual that signs a contract to perform the obligations of the Contractor.
- L. UTP: Unshielded twisted pair.

### 1.4 SUBMITTALS

- A. Submittals shall be provided by the contractor prior to the purchasing and installation of the equipment described in this specification. Product submittals and Shop Drawing submittals shall be presented at the same time to the reviewing Engineer for evaluation.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.

Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1. For each cable, include the following installation data for each type used:
  - a. Nominal OD.
  - b. Minimum bending radius.
  - c. Maximum pulling tension.
  
- C. Submit manufacturer's data sheets on all system components. Data sheets shall be neatly bound with title page, index/bill of materials, and tab dividers for each major section. If multiple products or configurations are shown on the same product document, the product and or configuration to be supplied and installed on this project shall be highlighted.
  
- D. Submit as a separate section of the submittal book, resumes of the key staff assigned to this project, listing their experience and qualifications including a statement of the contractor's qualifications and abilities. Provide detailed information showing how the contractor will provide engineering, CADD support, fabrication and testing of equipment prior to delivery to job site, and service after installation is complete.
  
- E. The format and details for the submittals shall include the following:
  1. Cover sheet: Title page including project name, project number, Contractor Name, Contractor Address, and contact person with phone number. Provide the name, phone number and address of any sub-contractors that will be used on the project.
  2. A complete bill of materials listing the following:
    - a. Applicable section/paragraph number from the project specification.
    - b. Manufacturer's name, model number (shall match spec sheet) and product description.
  3. Specification sheets for all equipment used on the project shall be inserted in the same chronological order as appearing in the specifications. Pages printed or copied from the web page or instruction manuals will not be accepted. Contractor shall highlight the product part number being submitted for review. Failure to highlight the product part number will be cause for rejection. The reviewing engineer will not assume the contractor will provide the specified part number.
  
- F. Shop Drawings: The contractor shall provide AutoCAD drawings detailing the information described below:
  1. Drawings shall show all interconnections between the building cabling, infrastructures, overall system connections, cable and connector types, cable labeling schemes, backboard layouts including cable pathways, all dimensions between termination blocks and equipment mounted to the backboard, and connections between major hardware components. Submit wiring diagrams showing typical connections for all equipment.
  2. AutoCAD drawings detailing the labels and locations of all voice, data, control, wap, and cctv outlets as shown on the drawings.
  3. AutoCAD drawings detailing the labels of all coaxial outlets as shown on the drawings.

4. System Labeling Schedules: AutoCAD electronic copy of labeling schedules, in software and format selected by Owner.
5. AutoCAD Cabling administration drawings and printouts.
6. Wiring diagrams to show typical wiring schematics, including the following:
  - a. Cross-connects.
  - b. Patch panels.
  - c. Patch cords.
7. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

G. Refer to Division 1 for any additional requirements.

H. Shop drawings and product submittals shall be provided as a complete submittal package. Only complete submittal packages will be reviewed by the Engineer. Partial submittal packages will automatically be rejected.

#### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of a BICSI Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as an RCDD to perform the on-site inspection.
4. Technicians: At least 75% of all cabling technicians on the project site shall be certified as a BICSI Level I Installer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index.
2. Smoke-Developed Index.

C. 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.

D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

E. Grounding: Comply with ANSI-J-STD-607-A.

#### 1.6 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and 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.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following sections list materials and products acceptable for this project. Bidders may submit other products for consideration as equals by sending a request to the Engineer in writing no less than 10 days prior to the bid date. Include manufacturer cut sheets and any other information required to evaluate requested substitution. If the proposed substitution is accepted, it will be added by addendum, allowing all bidders the option to use that equipment. ITEMS NOT SPECIFICALLY ADDED BY ADDENDUM WILL NOT BE ACCEPTED.

2.2 UTP & STP CABLE

- A. Provide Category-6 horizontal cabling to provide connectivity as shown on the Technology plans. Provide Category-6A horizontal cabling to each wireless access point outlet as shown on the Technology plans.
- B. All horizontal cabling shall be Category-6 UTP, 4 Pair, 23/24 AWG, solid conductor cable for outlets that are not for wireless access points.
- C. The cable jackets shall be clearly marked from the factory indicating the Category listing, plenum rating, and linear footage of cable from spool.
- D. The 4 pair UTP cable shall be UL<sup>®</sup> and c (UL<sup>®</sup>) Listed Type CMP (plenum). Provide wet listed cables where cabling is to be installed in conduit which is underground or within the ground floor concrete slab.
- E. White cable shall be provided for all voice outlets, blue cable shall be provided for all data and control outlets, Orange for Wireless Access points, Yellow for CCTV cameras and grey cable for USB and intra classroom Audio Video Outlets.
- F. The Category 6 cabling shall meet the Cat6 *minimum* standards as listed by ANSI/TIA 568-C.

Freq (MHz)	Attn Standard (dB)	NEXT Standard (dB)	PS NEXT Standard (dB)	ELFEXT Standard (dB)	PS ELFEXT Standard (dB)	Return Loss Standard (dB)
0.772	1.8	76.0	74.0	70.0	67.0	‡
1	2.0	74.3	72.3	67.8	64.8	20
4	3.8	65.3	63.3	55.7	52.7	23.0
8	5.3	60.8	58.8	49.7	46.7	24.5
10	6.0	59.3	57.3	47.8	44.8	25.0
16	7.6	56.2	54.3	43.7	40.7	25.0
20	8.5	54.8	52.8	41.7	38.7	25.0
25	9.5	53.3	51.3	39.8	36.8	24.3
31.25	10.7	51.9	49.9	37.9	34.9	23.6
62.5	15.4	47.4	45.4	31.8	28.8	21.5

Freq (MHz)	Attn Standard (dB)	NEXT Standard (dB)	PS NEXT Standard (dB)	ELFEXT Standard (dB)	PS ELFEXT Standard (dB)	Return Loss Standard (dB)
100	19.8	44.3	42.3	27.8	24.8	20.1
200	29.0	39.8	37.8	21.7	18.7	18.0
250	32.8	38.3	36.3	19.8	16.8	17.3

‡ Not Specified

- G. Manufacturer provided shall match the one provided in Section 271300 “Communications Backbone Cabling” and be an approved warranty partner with the connectivity system manufacturer supplied.
- H. Approved Category 6 products are Siemon 9C6-E2-02-RXA, Mohawk 6-LAN, Belden DataTwist 2413 series, General Cable Genspeed 6, Berk-Tek Lanmark-6, or Superior Essex 77-246-2B.
- I. Approved wet-listed Category 6 products are Mohawk VersaLAN M58772 series, General Cable GenSpeed 6 OSP, Berk-Tek LANmark-6 OSP, or Superior Essex BBD6 series.
- J. Approved Category 6A products are Mohawk GigaLAN 10, Belden 10GX, General Cable Genspeed 10,000, Berk-Tek Lanmark-10G2 or Superior Essex 6A-246-2B.
- K. Approved Shielded (STP) Category 6 products are Belden Cable Management DataTwist 2400 series, Mohawk CMP M5817X, Berk-Tek Lanmark-6 FTP, General Cable GenSpeed 6 FTP, or Superior Essex 6T-272-XA.

2.3 RJ-45 OUTLETS

- A. All Category-6 UTP cables shall terminate at the station end in an 8-pin RJ45 outlet with TIA-568B wiring configuration. Jacks at station end shall be modular jacks with appropriate faceplate containing labeling slot.
- B. All Category-6 outlets shall meet or exceed Category-6 transmission requirements for connecting hardware, as specified in ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and be part of the UL® LAN Certification and Follow-up Program.
- C. The Category-6 outlets shall be capable of being in a modular patching situation or as a modular telecommunication outlet (TO) supporting current 10Base-T, 100BASE-T, Token Ring, 100 Mbps TP-PMD, 155 Mbps ATM, 622 Mbps ATM using parallel transmission schemes and high-speed, high-bandwidth applications, including Ethernet 1000BASE-T and 1.2 Gbps ATM.
- D. Cat-6 modular outlets shall be supplied in colors (White for Voice outlets, Blue for data/control outlets, Orange for WAP outlets, Yellow for CCTV outlets and Grey for USB and intra classroom audio-video outlets. Color keyed icons and colored factory labeling strips are not acceptable.
- E. Approved Category 6 outlets – Siemon MX6-02 (white) or MX<sup>^</sup>-0<sup>^</sup> (blue), Hubbell HXJ-6, Ortronics OR-KS6, Leviton 61110-R\*6, or Belden Cable Management KeyConnect AX10132X.
- F. Approved Category 6A outlets - Belden Cable Management Keyconnect 10GX AX10228X, Hubbell HJ6AXX, Leviton 6110G-R\*6, or Ortronics OR-TK2J6A.

- G. Approved Category 6 outlets for STP cabling– Belden Cable Management 10GX KeyConnect AX104596, Hubbell SJ624B, Leviton 6S180-SH6, or Ortronics OR-TJS600.

#### 2.4 FACEPLATES

- A. All faceplates shall be white or telco ivory in color (unless stated otherwise) and be designed to mount the modular outlets supplied.
  - B. Data/Voice faceplates shall contain (4) four module positions minimum for single gang plates, and six (6) module positions minimum for double gang plates. Faceplates shall have recessed label holders with clear plastic protective cover. Provide blank inserts for all unused jack positions.
  - C. Wall outlets indicated for wall-mounted phones shall be recessed and contain a standard 2-pin hanger support for wall phone mounting.
  - D. Design Basis Faceplates: Data/Voice Single Gang – Siemon MX-FP-S-04-02, Hubbell IFP14EI, Leviton 42080-4IS, Ortronics OR-KSFP4, or Belden Cable Management KeyConnect AX102248
  - E. Design Basis Faceplates: Data/Voice Double Gang – Hubbell IFP26EI, Leviton 42080-8IP, Ortronics OR-KSFP8, or Belden Cable Management KeyConnect AX102670.
  - F. Design Basis Faceplates: Wall mounted telephone – Siemon or Hubbell IFP11EI, Leviton 4108W-1SP, Ortronics OR-403STJ1WP, or Belden Cable Management KeyConnect AX102902.
  - G. Design Basis Faceplates: Single port surface mount boxes for Wireless Connections – Hubbell ISM2EI, Leviton 41089-2IP, Ortronics OR-KSSMB2, or Belden Cable Management AX105353.
  - H. Design Basis Blank Inserts Hubbell SFB10, Leviton 41084-BI, Ortronics OR-KSB10, or Belden Cable Management AX102261.
  - I. Provide double gang multimedia faceplates at Teachers presentation locations (TO), audio/video locations (AV), LCD projector locations, Video outlet locations (VO) and other special locations as shown on the plans.
  - J. Design Basis Multi-Media Faceplates: Double Gang – Hubbell IMF2EI, Leviton 41290-DMI, Ortronics Series II OR-40300159, or Belden Cable Management MediaFlex AX101870.
  - K. Design Basis Multi-Media Faceplates: Single Gang – Hubbell IMF1EI, Leviton 41290-SMI, Ortronics Series II OR-40300011, or Belden Cable Management AX101746.
  - L. Provide blank inserts in all module positions not used - Hubbell IMB1EI, Leviton 41291-1BI, Ortronics Series II OR-40300164-13, or Belden Cable Management AX101758.
  - M. Provide 2-port 106 frames and faceplate covers to complete the connectivity required in floor boxes and dog house style pedestals as shown on the plans.
- #### 2.5 AUDIO/VIDEO CONNECTORS (SELECT CONNECTOR BASED ON DETAIL DRAWINGS)
- A. Provide complete connectivity as detailed on the plans and listed below. Listing of a manufacturer as an equal does not exempt them from requirement to supply multimedia connectivity.



- B. Contractor is responsible for providing all media connection modules required for a complete system as shown on the plans and listed in the specifications. The plans and specifications are complementary, items may be shown in either location or only one, supply all items shown or listed.
- C. Design Basis: Feed-Through “F” Connector – “F” connector shall be flush mounted in faceplate and occupy one module space. Hubbell SFFEX, Leviton 41084-F\*F, Ortronics OR-KSFCN, or Belden Cable Management AX104567.
- D. Design Basis: 110-Style audio RCA Connectors – RCA connectors shall be flush mounted in faceplate and occupy one module space. Provide jacks with Red and White insulators or icons for Audio Right and Left. Hubbell SFRC110R (Red), SFRC110W (White), Leviton 40735-RR\* (Red) / 40735-RW\* (white), Ortronics OR-KSRCAR (Red) /OR-KSRCAR (White), or Belden Cable Management AX101880 (Red) / NOT USED (White).
- E. Design Basis 3.5mm Stereo Connectors- shall be flush mounted in the faceplate and occupy one module space. Hubbell SF35SJ, Leviton 40839-SIS, Ortronics OR-KS35STST, or Belden Cable Management.
- F. Design Basis: VGA Connectors – VGA connector modules shall be a blank 1/3 unit insert. Pre terminated VGA female connector shall mount securely by means of threaded retaining nuts. Retaining nuts shall have sufficient depth to hold VGA patch cable in a fully seated position. VGA connectors which allow VGA patch cable to move or lose contact with connector are not acceptable, and shall be repaired or replaced at this contractor’s expense. 110-Style connectors will not be accepted. Hubbell 15S6P1, Ortronics Series II, or Belden Cable Management AX101886 with built-in VGA. XX denotes color

Approved VGA connectors: Rapid Run HD15 female lead, Major Custom Cables HD15 female or Hubbell X-End.

- G. Design Basis: Feed-Through “RCA” Composite Video Connectors – RCA feed-through connectors shall be flush mounted in faceplate and occupy one module space. Hubbell SFRCYFFTI, Leviton 40830-BIY, Ortronics OR-DSS2210, and Belden Cable Management AX101886. Feed-through RCA connectors shall only be used for the composite video applications as shown on the plans. Contractor shall terminate the coaxial cable with a male “F” connector and provide an “F”-female/RCA-male adapter to connect to the feed-through RCA connector.
- H. Design Basis: HDMI connectors-19 pin configuration supporting the HDMI 1.3 specification of 340MHz, 1080P and WQXGA across a single digital link. Provide connector and 1 unit bezel for A/V outlet. Approved HDMI connectors: Hubbell IMBDS1-xx with Hubbell IMBDS1\*\* bezel, Leviton 40834-\*, Ortronics OR-KSHDMI, or Belden Cable Management AX105345-BK (\*\* denotes color, color shall be white)
- I. Provide 2 port keystone, flat panel inserts to complete the faceplate installation. Keystone inserts will support RCA audio modules, S-video modules, RJ-45 Control Modules, “F” Feed thru modules, and Comp Video modules. Design Basis: Hubbell IM2K1, Leviton 41291-2QI, Ortronics OR-40300749, or Belden Cable Management AX102412.
- J. Cat 6 voice and data connectors shall be provided as specified above.
- K. Provide blank covers for all unused module positions. Blank covers shall match the faceplate color (Electric Ivory).

## 2.6 AUDIO/VIDEO CABLING

- A. Provide audio/video cabling at Teachers presentation locations, video projector locations, AV locations and other special locations as shown on the plans. Provide complete connectivity as detailed on the plans and listed below. Contractor is responsible for providing all media connection modules required for a complete system as shown on the plans and listed in the specifications. The plans and specifications are complementary, items may be shown in either location or only one, and contractor shall supply all items shown or listed.
- B. Cabling between the VGA connectors shall be pre-fabricated, manufacture produced RGB/SYNC, quick connect or plug-n-play style support XGA video imaging. The cable shall provide a quick connection to the VGA connector and be UL910and ETL listed type CMP. The cable shall be from the same manufacturer as the VGA connector. The contractor shall provide lengths based on field conditions, and final mounting dimensions. A 12” service loop at each termination point shall be provided. Approved VGA cable manufacturers” Hubbell VGA6PXXBK (XX denotes cable length) or equals by Rapid Run, C&M Corporation, or Major Custom Cables.
- C. Cabling between the composite video RCA feed-through connectors shall be an RG-59/U style plenum rated coaxial cable. The cable shall comply with UL910 and be ETL listed NEC type CL2P.
- D. HDMI horizontal cables - digital ribbon cables delivering 15GB/sec video bandwidth and easily handle up to 4K 60Hz@4:2:2 sampling, Full HD, 3D, HDMI-CEC, HDCP and most new hi resolution formats. Cables shall be UL listed and conform to either a plenum or non-plenum air environment. HDMI cables shall provide an optical to electronic conversion inside the connector to eliminate external power connectors or extenders. Cables shall be installed with a cable pulling sock with swivel device to eliminate local twisting of the cables. Cables shall be clearly identify the TX and RX connections. Contractors shall provide cables designed to meet the length requirements of each outlet as shown on the floor plan drawings. 271500 Contractor will be required to coordinate conduit pathways with the division 26 contractor to ensure cable lengths do not exceed 328 linear ft. Connectors shall be capable of being installed within a 1 ¼” conduit.
- E. Approved HDMI digital ribbon cable manufactures: FSR DR-PCB series, Celerity Technologies, Rainbow Fish or Cables2Go.
- F. HDMI patch cables for High Definition Video and multi-channel, digital audio between digital devices: Hubbell HDPC06BK (6 ft) or Hubbell HDPC03BK (3 ft). Belkin, Rapid Run or Major Custom Cables.
- G. 3.5 mm PC audio cable shall be 22AWG/2C twisted, shielded pair with overall plenum jacket. Approved 22AWG/2C cable shall be West Penn 452, Belden Cable Management 82761 or General Cable E2102S.

## 2.7 UTP PATCH PANELS

- A. Horizontal patch panels shall be provided as shown on the System Schematics and the Rack/Cabinet Elevations.
- B. Category-6 UTP horizontal cables shall terminate at the ER and TRs in an 8-pin, Cat-6, RJ45 connector with TIA-568B wiring configuration in a high density patch panel.
- C. Patch panels shall be 48-port maximum to allow installation of wire managers above and below panel for organized patching.

- D. Patch panels shall contain rear cable management bracket for guiding cables and providing strain relief at connection. Patch panels shall contain labeling fields above outlets. Colored factory labeling strips or colored tag indicators attached to patch panels are acceptable.
- E. All ports on the patch panels shall be filled with Cat-6 outlets.
- F. Separate patch panels shall be provided for each type of Cat-6 horizontal cables (Voice, Data, Control, WAP, etc.) in the quantities shown on the Rack/Cabinet elevations.
- G. Design Basis UTP Cat6 Patch Panel: Siemon HD6-24 (24 port) or Siemon HD6-48 (48 port), Hubbell HP624 (24-Port) or HP648 (48-port), Leviton 695866-U24 (24 port) or 69586-U48 (48 port), Ortronics OR-SP6U24 (24 port) or OR-SP6U48 (48 port), or Belden Cable Management AX103253 (24 port) or AX103255 (48 port). Manufacturer provided shall match the one provided in Section 271300 "Communications Backbone Cabling".
- H. Design Basis UTP Cat6A Patch Panel: Belden Cable Management AX105363 (24-Port) or AX105364 (48-Port), Hubbell HP6A24U (24-Port) or HP6A48U (48-Port), Leviton 6A586-U24 (24-Port) or 6A586-U48 (48-Port), or Ortronics OR-SPKSU24 (24-Port) or OR-SPKSU48 (48-Port). Manufacturer provided shall match the one provided in Section 271300 "Communications Backbone Cabling".
- I. Design Basis rear strain relief bar: Hubbell PCBLMGT, Leviton (included with patch panel), or Belden Cable Management (included with patch panel).

## 2.8 COAXIAL PATCH PANELS

- A. Provide coaxial patch panels as shown on the Video Distribution Details.
- B. Coaxial patch panels shall be modular, 48-port, large form factor, and contain labeling slots for each outlet.
- C. Every other position shall be filled with a blank insert, to provide a maximum of 12 "F" connectors per row. The top and bottom rows shall have the blank inserts offset from each other to provide access to each "F" connector without interference from an adjacent connector.
- D. "F" type feed-through modular connectors, as specified in Section 271500, shall be mounted in appropriate connector insert frames for the patch panel. Provide rear wire management for support of coax bundles and to maintain bend radius.
- E. The contractor shall provide wall mount rack frames to mount the coaxial patch panels as shown on the Video Distribution Details.
- F. Rack frames shall be a 12 ga. equipment frame with a black powder coat finish.
- G. Rack frames shall have a 70 lb. load capacity, contain 16" on center mounting, 3" deep rack uprights and EIA-310-D universal spacing tapped #12-24 front and back.
- H. Provide 24", 36" or 48" rack frames to provide mounting space for the coaxial patch panels, cable organizers, blank panels and CATV equipment shown on the Video Distribution Details.
- I. Design Basis Coax Patch Panel: Hubbell UDX48E1U, Leviton 49255-H48, Ortronics OR-PHDPJU48, or Belden Cable Management AX103115.

- J. Design Basis Wall Mount Rack Frame: Hubbell HPWWMR, Belden Cable Management XWR-3619-18, Leviton 49251-W64, or Ortronics OR-604004645.

## 2.9 COAXIAL VIDEO CABLING

- A. Type RG-6U quad shielded plenum cable shall be used for room outlet runs to TR or ER rooms.
- B. Provide an RG-6U cable from each coaxial outlet to the TR or ER serving the area as shown on the drawings. Terminate RG-6U cables on "F" pass through connectors. Assemble "F" connectors to coaxial patch panels as shown on the video distribution details.
- C. Minimum performance specifications for the RG-6U cable shall be:
  - 1. 18AWG solid bare copper center conductor.
  - 2. Foam FEP core insulation.
  - 3. Quad shield shall have two layers of aluminum braiding and two layers of bifoil aluminum wrap.
  - 4. Overall flexible Teflon FEP insulation.
  - 5. Nominal DC resistance 6.5 ohms per 1000 feet.
  - 6. Nominal capacitance of 16.2 pf/ft.
  - 7. Nominal velocity of propagation 82%.
  - 8. Attenuation per 100 feet (30.5 m) shall not exceed 8.20dB at 1,000MHz.
  - 9. 75 ohm nominal impedance.
- D. Provide one RG-6U cable from each coaxial outlet to the TR or ER serving that area as shown on the plans. Terminate RG-6U cables on coaxial patch panels as shown on the Video Distribution Details.
- E. Approved RG-6U Cable Manufacturers: West Penn 25Q841, Belden Cable Management 1189AP or Commscope 2227K.

## 2.10 PATCH CORDS

- A. Provide all Cat-6, Cat-6A and fiber optic patch cords required to provide all voice, data and backbone connections as shown on the plans and details.
- B. Category 6/6A patch cords.
  - 1. All Cat-6 and Cat-6A patch cords shall be supplied by the same manufacturer as the data connectivity. Provide one patch cable for every outlet at the station end and one patch cable for every outlet at the TC end (Exception: control outlets do not require Cat6 patch cables at either end unless a device is connected).
  - 2. Provide 1' patch cords within the TC. Provide 10' patch cables for all station outlets.
  - 3. Provide patch cable lengths to neatly route cables from the patch panel port to the network switch port without excessive webbing of unused length.
  - 4. Patch cables shall be supplied in the following colors based on use: Voice – White, Data – Blue, CCTV-Yellow and WAP- Orange, all others – Black.
  - 5. Design Basis Cat 6 Patch Cords – Hubbell PCX6, Leviton 62460, Ortronics OR-MC60\*-xx, or Belden Cable Management C60110XXXX.

6. Design Basis Cat 6A Patch Cords – Hubbell PC6AB03, Leviton 6210G, Ortronics OR-MC6A\*-xx, or Belden Cable Management CA2110XXXX.
- C. Fiber optic patch cords.
1. Provide duplex “LC” to “LC” multimode and simplex “LC” to “LC” single mode fiber optic patch cords for each fiber outlet required in the ER/TR. Provide equal amounts of 1 and 2 meter patch cables. Multimode patch cords shall be aqua and single mode patch cords shall be yellow.
  2. Design Basis Multimode Fiber Optic Patch Cords – Hubbell DFPCLCLCF\*\*MM, Belden Cable Management FP4LDLD002M, Leviton 54DLCM0\* or Ortronics Optimo.
  3. Design Basis Single Mode Fiber Optic Patch Cords – Ortronics Optimo, Leviton UPDLCS0\*, Belden Cable Management FPSLDLD003M or Hubbell DFPCLCLCS\*\*SM.

### PART 3 - EXECUTION

#### 3.1 WIRING METHODS

- A. Install cables in raceways and cable trays except within consoles, cabinets, desks and counters. Conceal raceway and cables except in unfinished spaces.
- B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Bundle, lace, and train cables within cabinets, racks and enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- D. Cable slack shall not be stored in bundled loops. Store cable slack in an extended loop or in a figure 8 configuration to alleviate stress and potential RL issues.
- E. General Requirements for Cabling:
  1. Comply with TIA-568-C.1
  2. Install 110-style IDC termination hardware unless otherwise indicated.
  3. Terminate all conductors; no cable shall contain un-terminated elements unless noted specifically on the plans. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
  4. Cables may not be spliced. Secure and support cables at intervals not exceeding 48 inches and not more than 12 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
  6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Use d-rings, j-hooks, lacing bars and distribution spools.
  7. 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.
  8. Cold-Weather Installation: Bring cable to room temperature before unreeling. Heat lamps shall not be used for heating.

### 3.2 CAT-6 UTP INSTALLATION

- A. Provide a Cat-6 UTP cable from each Cat-6 data/voice outlet shown on the plans to a patch panel located in nearest ER/TR, not exceeding 90 meters.
- B. Provide 12” slack at the station outlet end of each Cat-6 cable. Provide 10’ slack at the patch panel end
- C. Cable slack at the patch panel end of each cable shall be stored in the vertical cable manager, provided as part of the cabinet or rack, by routing the cable down the vertical cable manager past the termination patch panel to the bottom of the rack/cabinet and then back up the vertical cable manager into the associated patch panel.
- D. Provide two (2) Cat-6 cables to the fire alarm control panel auto dialer, final connection at FACP shall be by the fire alarm system supplier. Terminate in the ER on an RJ31x jacks and connect to analog C.O. lines.
- E. Provide two (2) Cat-6 cables to the security system control panel auto dialer, final connection shall be by the security system supplier. Terminate in the ER on an RJ31x jacks and connect to analog C.O. lines.
- F. Provide a Cat-6 cable to the elevator equipment room as shown on the plans, coordinate final location with elevator equipment supplier. Terminate in the ER on an RJ31x jack and connect to an analog C.O. line.
- G. Provide Cat-6 cables with outlets at the HVAC controller locations as shown on the drawings.

### 3.3 RG-6U COAXIAL INSTALLATION

- A. Provide an RG-6U coaxial cable from each coaxial outlet shown on the plans to a patch panel located in nearest ER/TR, not exceeding 90 meters.
- B. Provide 12” slack at the station outlet end of each coax cable. Provide 10’ slack at the patch panel end of each coax cable.
- C. Cable slack at the patch panel end of each cable shall be stored in the vertical cable manager, provided as part of the cabinet or rack, by routing the cable down the vertical cable manager past the termination patch panel to the bottom of the rack/cabinet and then back up the vertical cable manager into the associated patch panel.

### 3.4 GENERAL CABLE INSTALLATION

- A. Provide multimedia A/V cabling and outlets as indicated by faceplate configurations for multimedia interface between teacher’s outlets, A/V outlets, and projector input outlets.
- B. Label all wires and connectors at each end with the standard identification as supplied by the owner and engineer. Provide temporary cable labels for use during cable pulling and installation; provide permanent type printed labels on cable after cables are terminated. Faceplate labels shall be permanent and located in manufacturer provided labeling slots with clear protective cover. “P-Touch” or other consumer style labels applied directly to the faceplate is not acceptable. All labels shall be neatly typed. Labeling scheme must be exactly as supplied and approved by owner, any labeling not approved by the owner and engineer shall be relabeled at the contractor’s expense. Refer to contract drawings for owners

labeling scheme. Any changes must be approved in writing from the owner and engineer before performing the work, all unauthorized labeling will be re-done at the contractor's expense.

- C. Provide a "record drawing" set of plans to Owner and Engineer showing all data locations, wiring and labeling schemes as installed. Drawings shall be turned over in printed format as well as in electronic format. Electronic format for shop drawings and cut sheets is required as well.
- D. All cabling installations shall meet all ANSI/TIA standards and TSBs. All cabling shall meet UL LAN cabling certification. The CAT 6 cabling shall be tested up to 250 MHZ minimum and meet all protocol standards up to 1Gbps transfer as installed. Testing of cable shall be submitted in chart format listing label of cable and associated attenuation, length, NEXT, capacitance and shall be measured end-to-end after installed. MM Fiber shall be tested at 850 nm and 1300 nm and SM Fiber shall be tested at 1310 nm and 1550 nm with an insertion light meter or OTDR (OTDR's are not an accurate measurement of link loss, really a troubleshooting or length verification tool) and insertion loss shall be logged from connector end to connector end after installed. At time of final punch, this Contractor shall provide spot checks to match logged values in presence of Engineer, providing all equipment necessary. The contractor shall provide all test results in paper as well as electronic format for review.
- E. Each reel of coaxial cable used in the system shall be sweep tested. Transmission sweep tests shall establish conformance to guaranteed loss values from 20MHz to 108MHz; 174MHz to 216MHz; and 470MHz to 890MHz. Structural return loss tests by sweep method shall show a minimum return loss of 26dB RL VHF, 16dB RL UHF, as compared to a fixed 75 ohm reference from 20MHz to 108MHz; 174MHz to 216MHz; and from 470MHz to 890MHz. Coaxial cables shall be run in continuous lengths except for terminations and no splices shall be permitted in any run. Cables shall be installed to avoid sharp bends or physical distortion. All cables shall be homerun.
- F. Maintain all bending radii of cabling and provide necessary raceway accessories to accomplish this. All cabling shall be plenum rated.
- G. All cabling above ceiling shall run parallel/perpendicular to building lines and be supported by j-hook at 5' centers where not supported in the corridor cable tray. Technology cables shall not be supported with ceiling grid wire that is supported a suspended ceiling. Contractors shall provide an independent ceiling support grid wire structure for technology cables. Technology cables shall be neatly tie wrapped every 3 ft. on center.
- H. All video cabling shall be run in separate j-hooks. All cable bundles shall be neatly organized and tie-wrapped on 3' centers. All tie-wraps (Thomas & Betts "Ty-Rap" or equals by Ideal or Panduit) used shall be stress-relief type so that excessive pressure may not be applied; wraps shall be plenum rated. Velcro ties are acceptable within the ER or TR.
- I. One hundred percent spare capacity shall be maintained for future cabling in cable tray spans in each corridor section. Only Cat 6 data/voice cabling, multi-conductor voice backbone and fiber optic backbone cabling may be contained within the cable tray system.
- J. UTP Cable Installation:
  - 1. Comply with TIA-568-C.2.
  - 2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

K. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway, a minimum of 6 inches above ceilings, by cable supports not more than 48 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts or other potentially damaging items.

L. Separation from EMI Sources:

1. Comply with 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 communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 6 inches.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways 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.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways 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.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 6 inches.

3.5 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping". Comply with TIA/EIA-569-C, Annex A, "Firestopping."

3.6 GROUNDING

- A. Comply with ANSI-J-STD-607-B.



- B. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

### 3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-B. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  - 1. Administration Class: 2.
  - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion about TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-B for Class 2 level of administration.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- E. Cable and Wire Identification:
  - 1. Label each cable between 2 and 6 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
  - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 25 feet.
  - 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    - a. Individually numbered wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
    - b. Label each unit and field within distribution racks and frames.
  - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-B, for the following:
- G. Cables use flexible vinyl or polyester that flexes as cables are bent.

### 3.8 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually confirm Category-6 marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. UTP Permalink Performance Tests:
  - a. Test for each. Perform the following tests according to TIA -568-C.1 and TIA -568-C.2:
    - 1) Wire map.
    - 2) Length (physical vs. electrical, and length requirements).
    - 3) Insertion loss.
    - 4) Near-end crosstalk (NEXT) loss.
    - 5) Power sum near-end crosstalk (PSNEXT) loss.
    - 6) Equal-level far-end crosstalk (ELFEXT).
    - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
    - 8) Return loss.
    - 9) Propagation delay.
    - 10) Delay skew.
5. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
  - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
  - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

B. Document data for each measurement. Data for submittals shall be printed in a summary report that is transferred from the instrument to the computer, saved as text files, and printed and submitted.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

### 3.9 CLOSE OUT DOCUMENTATION

- A. In addition to the requirements described in Section 27 01 00 Operations and Maintenance of Communication Systems, the installation contractor shall provide a separate tab identified as HORIZONTAL CABLING TEST RESULTS and a separate tab identified as MANUFACTURER

WARRANTY. All horizontal test results shall be presented for Engineer evaluation and included in the Manufacturer's Application and Performance Warranty and Inspections.

- B. Items mentioned in paragraph A above shall be presented with the contractor's final as-built drawings as a complete package. Only complete packages will be reviewed. Partial packages will be rejected.

END OF SECTION 271500

## SECTION 275123 – IP BASED CENTRAL SOUND SYSTEM

### 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 specifies a central sound system including the following:
  - 1. Paging Horns
  - 2. VoIP Gateways and paging amps
- B. All work shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials.
- C. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.
- D. The Contractor must demonstrate to the Owner and Engineer that the systems are complete and complies with all operational requirements set forth in the plans and specifications.
- E. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.
- F. It is the Contractor's responsibility to review the architectural, structural, mechanical, and electrical drawings, as well as the specifications, for any details that may impact the installation or provisioning of the system. Any discrepancies discovered shall be brought to the attention of the Engineer.

#### G. SCOPE OF WORK

- 1. Supply and install a completely operational, IP based, integrated, single channel public address communication system as shown on the drawings and specifications herein. This system shall contain amplifiers, cabling, ancillary devices and software necessary for a complete operating system providing the functions and features described below. System shall provide one intercom with one uni-directional line of integration to the telephone system in the building. All cabling required for cross-connects, speakers, and other required accessories shall be provided by this contractor.
- 2. The IP Public Address system for the project is to be interconnected over the LAN using VoIP technology and shall be interfaced with the telephone switch in each building, allowing authorized telephones to make: all pages, zone pages.
- 3. Public Address supplier is required to coordinate with the Telecommunications equipment and shall provide the required integration between the systems. Intercom system must provide and receive the signaling required to meet the requirements specified above. Public Address supplier is required to program their system in conjunction with the telephone supplier to provide seamless interface.

4. Supply and install a complete fully integrated communication system capable of providing the following features: Public Address, VoIP paging into vehicle storage and integration to building telephone system, as indicated on the minimum outline of features and capabilities, drawings and specifications herein.
5. Paging: All Call paging to vehicle storage paging horn

### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets on all system components. Data sheets shall be neatly bound with title page, index/bill of materials, and tab dividers for each major section. If multiple products or configurations are shown on the same product document, the product and/or configuration to be supplied and installed on this project shall be highlighted.
- B. Specification sheets shall be submitted on all items including cable types.
- C. Submit as a separate section in the submittal book, a valid certificate from the equipment manufacturer verifying completion of Installation and Service Training by at least one (1) technician that will be working on this project consistently, and a proof of Authorized Dealer Status including ability to offer a full warranty for the system being supplied..
- D. The format and details for the submittals shall include the following:
  1. A complete Bill of Materials listing the following:
    - a. Applicable section/paragraph number from the project specification.
    - b. Manufacturer's name.
    - c. Manufacturer's model number. (shall match spec sheet)
    - d. Product description.
  2. Specification sheets for all equipment used on project – including cable and connectors. Pages printed or copied from a web page or instruction manuals will not be accepted.
- E. AutoCAD Shop drawings: Submit layout drawings, including point to point wiring diagrams on 1/8" = 1' scale floor plans, all components, and accessories on 30" by 42" (standard "E" size) blue line prints.
- F. Shop drawings are to be submitted together with product submittals as one complete submittal. Only complete submittals will be accepted for review and approval. Any partial submittals will be rejected.
- G. Refer to Division 1 for any additional requirements.

### 1.4 QUALITY ASSURANCE

- A. The intent of this specification is to describe and provide for a complete system of professional quality suitable for constant use in an institutional setting.
- B. The supplier or sub-contractor for these systems must be a single firm whose primary business is the supply and installation of systems described herein.
- C. The supplier or sub-contractor must show a successful record of installations of similar size and complexity over the past five years that were installed and commissioned by their own forces.

- D. All major equipment for this specification shall be supplied by an authorized dealer of said equipment, who maintains a facility with adequate space for fabrication, assembly and testing of racks, clusters, and ancillary equipment, who owns all test equipment required for installation of systems, and has the facilities and staff to produce shop drawings, submittals, owners manuals, and training documents required by these specifications.
- E. This Contractor will be responsible for ensuring that their suppliers and sub-contractors meet the above requirements, and are authorized dealers for the equipment supplied with full warranty privileges and adequate service stock to meet the requirements of this specification.
- F. All work under this specification will be performed under the supervision of an individual who is experienced with the requirements for installation of a system as described herein, and documented successful experience testing, adjusting, balancing, equalizing, and operating said systems. Provide resume of project leader with submittals showing conformance to above requirements.
- G. All termination of wires and cables to electronic equipment, terminals, outlets, or any other system connection, will be performed by technicians who are experienced in the installation of these systems and their interconnections.
- H. This Contractor is responsible for coordinating all rough-in locations with actual equipment furnished, and verification of dimensions and conditions at the job site, which might affect the systems installation.

#### 1.5 COORDINATION

- A. Coordinate layout and installation of all equipment with the service providers and other trades work as it relates to the installation of this system.

#### 1.6 WARRANTY

- A. Provide a 3-year parts and labor warranty.

### PART 2 - PRODUCTS

#### 2.1 PUBLIC ADDRESS SYSTEM OPERATION

- A. Distribution of paging function via the wall mounted speaker via any telephone within the building.

#### 2.2 POWER AMPLIFIERS

- A. Provide SIP gateway with integral amplifier for paging. Basis of design is Valcom VIP-851-70/100, Bogen NQ-PA120, or Viking PA-IP.

#### 2.3 PAGING HORNS

- A. Provide paging horn where shown on plans.
- B. Design Basis Paging Horn: Bogen HS15EZ, Viking 25AE or Atlas GA-15T.

#### 2.18 CABLE

- A. Paging horn: Provide 18 AWG/ 2conductor shielded plenum speaker cable with white outer jacket and black-red conductor jacket. Cable shall be UL type CL3P/FPLP/CMP passes NFPA 262/UL910 flame test.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

#### A. General Requirements:

1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 48 inches and not more than 12 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. 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.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.

#### B. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.
2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches above ceiling by cable supports not more than 48 inches apart.
3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.

#### C. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

#### D. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

#### E. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

#### F. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

### 3.2 RACEWAYS AND CABLES

#### A. All low voltage wires and cables concealed in walls shall be run in EMT conduit from the flush outlet box to above accessible ceiling.

#### B. Provide conduit sleeves where cables penetrate firewalls above ceilings.

#### C. All low voltage cable shall be plenum rated.

- D. Only data and voice cables are to be installed in the corridor cable tray system. All other low voltage cabling shall be *grouped and bundled* in a neat fashion and secured to J-hooks with tie-wraps (Thomas & Betts "Ty-Rap" or equals by Ideal or Panduit) every five (5) feet.
- E. Provide adequate separation between conductors of different signal levels to prevent cross talk. Where cables must cross, cross at 90-degree angles.
- F. Bridal ring type hangers are not acceptable. Only hangers that provide adequate bend radius protection will be accepted.
- G. No raceway or open cabling shall be located in proximity of hot water lines or excessive heat.

### 3.3 GROUNDING AND BONDING

- A. Ground all metallic equipment in accordance with ANSI-J-STD-607-A.
- B. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.
- C. Refer to Section 270500 for additional grounding requirements.

### 3.4 SYSTEM PROGRAMMING

- A. Programming: Fully brief Owner on available programming options. Record Owner's decisions and set up initial system program. Prepare a written record of decisions, implementation methodology, and final results.

### 3.5 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. Schedule tests with at least seven days' advance notice of test performance.
  - 2. After installing intercommunications and program systems and after electrical circuitry has been energized, test for compliance with requirements.
  - 3. Operational Test: Test originating station-to-station, all-call, and page messages at each intercommunication station. Verify proper routing and volume levels and that system is free of noise and distortion. Test each available message path from each station on system.
  - 4. Frequency Response Test: Determine frequency response of two transmission paths, including all-call and paging, by transmitting and recording audio tones. Minimum acceptable performance is within 3 dB from 150 to 2500 Hz.



5. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:
    - a. Disconnect speaker microphone and replace it in the circuit with a signal generator using a 1000-Hz signal. Measure signal-to-noise ratio at speakers.
    - b. Repeat test for four speaker microphones and for each separately controlled zone of paging loudspeakers.
    - c. Minimum acceptable ratio is 35 dB.
  6. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 150, 200, 400, 1000, and 2500 Hz into each paging and all-call amplifier. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 5 percent total harmonics.
  7. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at three locations in each paging zone. Maximum permissible variation in level is plus or minus 3 dB; in levels between adjacent zones, plus or minus 5 dB.
  8. Power Output Test: Measure electrical power output of each paging amplifier at normal gain settings of 150, 1000, and 2500 Hz. Maximum variation in power output at these frequencies is plus or minus 3 dB.
  9. Signal Ground Test: Measure and report ground resistance at system signal ground. Comply with testing requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.
- E. Intercommunications and program systems will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

### 3.6 STARTUP SERVICE

- A. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
- B. Complete installation and startup checks according to manufacturer's written instructions.

### 3.7 ADJUSTING

- A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.
- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

### 3.8 TRAINING

- A. Provide sixteen hours of training for the owner on the system described herein.

- B. The contractor shall show the owner all main connection points for the system, and explain the function of the system and each major component type. The contractor shall instruct the owner in any maintenance requirements, and procedures to be followed when new equipment is added to the system in the future.
- C. Provide information on all systems including any applicable test results in the owners and operators manuals.
- D. This training shall be video taped and two copies in digital format shall be turned over to the owner with the close out documents.
- E. Contractor shall obtain a sign-off from the owner that they have received adequate training for the equipment. The contractor shall submit this form with their as-built information to be delivered to the owner.

END OF SECTION 275123



## SECTION 31 10 00 - SITE CLEARING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Clear site of plant life, trees and grass.
2. Remove root system of existing shrubs.
3. Remove existing surface debris.
4. Demolition of any existing construction foundations.

##### B. Related Sections:

1. Section 31 25 00 - Erosion and Sediment Controls
2. Section 02 41 00 – Site Demolition

#### 1.2 REGULATORY REQUIREMENTS

- A. Conform to applicable local building code for disposal of debris on site.
- B. Dispose of unsuitable solid waste materials off site in a manner complying with local, state and Federal agencies having jurisdiction over the Work.
- C. Coordinate clearing work with utility companies.

#### 1.3 JOB CONDITIONS

- A. Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent facilities.
- B. Do not close or obstruct streets, walks, or other facilities without permission from appropriate authorities.
- C. Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
- D. Schedule work of this Section so as not to interfere with work required by other Sections.

### PART 2 - PRODUCTS

Not Used.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that soil erosion and water pollution controls as specified in Section 31 25 00 Erosion and Sediment Control are properly located and installed prior to initiating work.

### 3.2 CLEARING

- A. Clear areas required for access to site and execution of work.
- B. Method of Clearing: Use equipment and procedures as required to complete the work.
- C. Remove existing shrubs, trees and other vegetation within marked areas. Grub out roots and surface rock.
- D. Clear undergrowth and deadwood, without disturbing subsoil.
- E. Existing trees scheduled to remain: Do not tunnel through tree roots; do not nail anything to trees; do not drive trucks over tree root system.
- F. Restore existing materials, systems, or improvements damaged during work of this Section to their original condition as acceptable to Architect at no additional cost to Owner.
- G. Do not burn materials on Owner's property.
- H. Abandonment or removal of certain underground conduit or pipe may be included in Division 15 and 16 work and is included under work of those Divisions. Removal of abandoned underground conduit or pipe which interfaces with site clearing is included under scope of this Section.
- I. Do not cover up brush and similar debris with earth.
- J. Refill depressions created by removal of stumps and large roots with suitable compacted earthfill where necessary to bring grade back to its original elevation or final grade.

### 3.3 PROTECTIONS

- A. Protect above and below grade utilities scheduled to remain.
- B. Protect bench marks from damage or displacement.
- C. Maintain designated site access for vehicle and pedestrian traffic.
- D. Protect exposed bare earth by mulch or other approved method if site clearing operations are completed two days prior to construction, excavation, or utility installations.

### 3.4 DISPOSAL

- A. Remove existing surface debris from site.
- B. Properly dispose of debris. Notarize and certify to Owner in writing the following:
  - 1. Locations where debris was disposed off site.
  - 2. That disposal complied with applicable environmental regulations.

**END OF SECTION 31 10 00**



## SECTION 31 20 00 – EARTH MOVING

### PART 1 – GENERAL

#### 1.01 SUMMARY

##### A. Section Includes:

1. Building excavations.
2. Building perimeter backfilling to subgrade elevations.
3. Fill under slabs-on-grade, footings, and foundations.
4. Compaction requirements.

##### B. Related Sections:

1. Section 31 10 00 – Site Clearing
2. Section 31 25 00 – Erosion & Sediment Control

##### C. Work Excluded:

Do excavation, trenching, backfilling, and compacting incidental to underground installations of Division 22 and 26 Work by appropriate trade. Coordinate such Work of this Section.

#### 1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

#### 1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to this effective date of this Contract shall be applicable to this Project.
- C. All materials, installation, and workmanship shall comply with all applicable requirements and standards.

#### 1.04 DEFINITIONS

- A. Borrow: Borrow excavation shall consist of approved select fill material imported from off-site when sufficient approved select fill material is not available from excavations.



- B. Clearing: Clearing shall consist in the felling, cutting up, and satisfactory disposal of trees and other vegetation designated for removal in accordance with these specifications.
- C. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- D. Fill (in terms of volume): In terms of volume, fill is defined as a compacted post-construction volume in-place.
- E. Grubbing: Grubbing shall consist of the removal of roots 1 ½ inch and larger, organic matter and debris, and stumps having a diameter of three inches or larger, to a depth of at least 18 inches below the surface and or subgrade, whichever is lower, and the disposal thereof.
- F. Base Course: The layer placed between the subgrade and surface pavement in a paving system.
- G. Regular Excavation: Removal and disposal of any and all material above subgrade elevation, except solid rock and undercut excavation, located within the limits of construction.
- H. Rock Excavation: Removal and satisfactory disposal of all unsuitable materials, which, in the opinion of the A/E, cannot be excavated except by drilling, blasting, wedging, jack hammering, or hoe ramming. It shall consist of un-decomposed stone, hard enough to ring under hammer. All boulders containing a volume of more than ½ cubic yard and/or solid ledges, bedded deposits, un-stratified masses, and conglomerations of material so firmly cemented as to possess the characteristics of solid rock that cannot be removed without systematic drilling, blasting, or hoe ramming will be classified as rock.
- I. Drainage Fill: Course of washed granular material supporting slab on grade placed to cut off upward capillary flow of pore water.
- J. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of A/E. Unauthorized excavation, as well as remedial work directed by A/e, shall be at Contractor's expense.  
  
Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to A/E.  
  
In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by A/E.
- K. Select Fill Material: Non-plastic material obtained from roadway cuts, borrow areas, or commercial sources used as foundation for subgrade, shoulder surfacing, fill, backfill, or other specific purposes.
- L. Engineered Fill: Select fill as defined above.
- M. Structures: Incidental buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

- N. Topsoil: Topsoil shall consist of friable clay loam, free from roots, stones, and other undesirable material and shall be capable of supporting a good growth of grass.
- O. Undercut Excavation: Undercut excavation shall consist of the removal and satisfactory disposal of all unsuitable material located below subgrade elevation. Where excavation to the finished grade section results in a subgrade or slopes of muck, peat, matted roots or other unsuitable materials, the Contractor shall immediately notify the A/E.
- P. Additional Excavation: When excavation has reached required subgrade elevations, notify A/E, who will make an inspection of conditions. If Owner determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by A/E. The Contract Sum may be adjusted by an appropriate Contract Modification.

Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

- Q. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular base, drainage fill, or topsoil materials.

#### 1.05 SUBMITTALS

- A. Material Test Reports: Provide from a qualified testing agency test results and interpretation for compliance of the following requirements indicated:

Classification according ASTM D2487 of each on-site or borrow soil proposed for backfill, unless otherwise directed by the A/E.

Laboratory compaction curve according to ASTM D698 for each on-site or borrow soil material proposed for fill or backfill.

Laboratory analysis reports indicating compliance with ODOT gradation and physical properties specifications for all granular materials including bedding, backfill and pavement base.

Field Test Results for each test group as required in item 3.18 of this specification.

#### 1.06 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing as documented according to ASTM D 3740 and ASTM E 548. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.
- B. The Contractor shall comply with the latest revision of the Occupational Safety and Health Standards for the Construction Industry.
- C. Materials and operations shall comply with the latest revision of the Codes and Standards listed below:

***Ohio Department of Transportation***

**ODOT-CMS** Construction and Materials Specifications, Current Edition

***American Society for Testing and Materials***

- ASTM C 33 Concrete Aggregates
- ASTM C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates  
Sieve Analysis of Fine and Coarse Aggregate
- ASTM D 422 Standard Test Method for Particle-Size Analysis of Soils (for classification  
purposes only)
- ASTM D 698 Test Method for Laboratory Compaction Characteristics of Soil Using  
Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (Standard Proctor)
- ASTM D 1556 Standard Method of Test for Density of Soil in Place by the Sand-Cone  
Method
- ASTM D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using  
Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (Modified Proctor)
- ASTM D1883 Standard Test Method for CBR (California Bearing Ratio) of Laboratory-  
Compacted Soils
- ASTM D 2049 Standard Method of Test for Relative Density of Cohesionless Soils
- ASTM D2167 Standard Method of Test for Density of Soil in Place by the Rubber-Balloon  
Method
- ASTM D 2487 Standard Classification of Soils for Engineering Purposes (Unified Soil  
Classification System)
- ASTM D 2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear  
Methods (Shallow Depth)
- ASTM D 4253 Standard Test Methods for Maximum Index Density and Unit Weight of  
Soils Using a Vibratory Table
- ASTM D 4254 Test Method for Minimum Index Density and Unit Weight of Soils and  
Calculation of Relative Density
- ASTM D 4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

***American Association of State Highway & Transportation Officials***

- AASHTO T 99 The Moisture-Density Relations of Soils using a 5.5-pound hammer and a  
12-inch drop
- AASHTO T 180 The Moisture Density Relations of Soils using a 10-pound hammer and  
an 18-inch drop
- ASHTO M 145 The Classification of Soils and Soil-Aggregate Mixtures for Highway  
Construction

1.07 STANDARD ABBREVIATIONS

**ANSI** American National Standards Institute

**MSDS** Material Safety Data Sheets

**OSHA** Occupational Safety and Health Administration

**ODOT** Ohio Department of Transportation

1.08 TESTING SERVICES

- A. The Testing Laboratory shall be approved by the A/E and will be responsible for conducting and interpreting tests. The Testing Laboratory shall state in each report whether or not the test specimens conform to all requirements of the Contract Documents and specifically note any deviation.

B. Specific test and inspection requirements shall be as specified herein.

#### 1.09 PROJECT CONDITIONS

A. Site Information: Data in subsurface investigation reports was used for the basis of the design and are available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.

Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.

B. Existing Utilities: The contractor shall contact the Ohio Utilities Protection Service, the Owner of the Utility, and Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility Owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility Owner.

Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Owner and then only after acceptable temporary utility services have been provided.

Provide minimum of 48 hour notice to Owner, and receive written notice to proceed before interrupting any utility.

Demolish and completely remove from Site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

C. The use of explosives is not permitted.

D. Barricade open excavations occurring as part of this work and post with warning lights.

Operate warning lights as recommended by authorities having jurisdiction.

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

E. Geotechnical Investigation

Where a Geotechnical report has been provided to the Contractor, the data on sub-surface soil conditions is not intended as a representation or warranty of the continuity of such conditions

between borings or indicated sampling locations. It shall be expressly understood that the Owner will not be responsible for any interpretations or conclusions drawn there from by the Contractor. Data is made available for the convenience of the Contractor.

In addition to any report that may be made available to the Contractor, the Contractor is responsible for performing any other soil investigations he/they feel(s) is necessary for proper evaluation of the site for the purposes of planning and/or bidding the project, at no additional cost to the Owner.

- F. Environmental: Before crossing or entering into any jurisdictional wetlands, Contractor shall verify whether or not a wetlands permit has been obtained for the encroachment and whether special restrictions have been imposed. Care shall be taken to prevent draining or otherwise destroying non-permitted wetlands. Restore as stated on either the project drawings, the contract documents, and/or as noted in the permit.

#### 1.10 COORDINATION

- A. Coordinate tie-ins to municipal system with the utility owner.
- B. When traffic signals or their appurtenances are likely to be damaged or interfered with as a result of the construction, coordinate temporary operation with the Local Traffic Engineer. Provide a minimum of 48 hours notice prior to anticipated disturbance or interruption.
- C. Benchmark/Monument Protection: Protect and maintain benchmarks, monuments or other established reference points and property corners. If disturbed or destroyed, replace at no extra cost (contractor's expense) to the full satisfaction of the Owner per the standards of the County Engineer's Office.

### PART 2 – PRODUCTS

#### 2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

#### 2.02 SOIL MATERIALS

- A. Provide approved borrow soil materials from off Site when sufficient approved soil materials are not available from excavations. The contractor shall make their own determination regarding the need to bring in fill or haul off excess material and provide fill or haul-off at no additional cost to the owner.
- B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups (Unified Classification System) GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
- C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT; soils that contain rock or gravel larger than 2 inches in any dimension, debris, organic matter, waste, frozen materials, muck, roots, vegetation, and other deleterious matter. Unsatisfactory soils also include satisfactory soils not maintained within

- 20-percent of optimum moisture content at time of compaction, unless otherwise approved by either the A/E or a Geotechnical Engineer.
- D. Select Fill Material: Sandy clay or clayey sand with a Plasticity Index of between 7 and 20, with a minimum Liquid Limit of 30, with less than 50 percent by weight passing a No. 200 sieve, and free of rock or gravel larger than 2 inches in any dimension, debris, waste, vegetable, or other deleterious matter.
  - E. Bedding Material: Unless otherwise indicated; base materials with 100 percent passing a 1 inch sieve and not more than 8 percent passing a No. 200 sieve.
  - F. Drainage Fill: Uniformly graded mixture of natural or crushed gravel, crushed stone, and natural sand, conforming to the fine aggregate (Concrete Sand) requirements of ASTM C 33 (ODOT 703.02 Aggregate for Portland Cement Concrete A. fine Aggregate), with 100 percent passing a ¼ inch sieve and 2 percent to 10 percent passing a No. 100 sieve.
  - G. Filtering Material: Uniformly graded mixture of natural or crushed gravel, or crushed stone and natural sand conforming to ASTM C 33, Coarse Aggregate Size No. 67, with 100 percent passing a 1 inch sieve and 0 percent to 5 percent passing a No. 8 sieve.
  - H. Impervious Fill: Lean clay with a Liquid Limit of less than 50 and capable of compacting to a dense composite.
  - I. Cement Stabilized Sand Backfill Material: Uniformly graded mixture of natural or crushed stone, crushed slag or natural or crushed sand conforming to the fine aggregate (Concrete Sand) requirements of ASTM C 33 with 100 percent passing a ¼ inch sieve and less than 15 percent passing a No. 200 sieve and not less than 1½ sacks of portland cement conforming to ASTM C 150, Type 1 requirements per cu. yd. of mixture and enough water free of deleterious materials to produce a mix suitable for mechanical hand compaction. Stamp batch tickets at plant with time of loading. Material not compacted in place 1 1/2 hours after loading or material which has taken an initial set will be rejected and shall be removed from the Project Site.
  - J. Topsoil: Topsoil meeting the definition prescribed in paragraph 1.04 of this specification and meeting the following requirements obtained either from on-site or an off-site source.
    - 1. Acidity: Range from ph 5.9 to 6.9, containing not less than 3 percent decaying organic matter as determined by loss of ignition of moisture free samples dried at 100 degrees C.
    - 2. Make-Up: Natural clean, fertile, friable loam or clay without admixtures of subsoil clay or slag. Topsoil shall be free from stones, lumps, roots, leaves, branches, twigs, garbage, weeds, or weed seed and other debris.
  - K. Rock Channel Protection, Riprap and Riprap Bedding: Per ODOT Item 601.

## 2.03 ACCESSORIES

- A. Detectable Warning Tape: Acid and alkali resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core

encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to thirty inches deep.

Provide tape colors to utilities as follows:

Red: Electric

Yellow: Gas, oil, steam, and dangerous materials

Orange: Telephone and other communications

Blue: Water systems

Green: Sewer systems

### PART 3 – EXECUTION

#### 3.01 GENERAL

- A. Contractor shall plan construction to minimize disturbance to properties adjacent to the project site and be within the construction limits shown on the plans.
- B. The A/E reserves the right to limit the width of land to be disturbed and to designate on the drawings or in the field certain areas or items within this width to be protected from damage.
- C. The Contractor shall provide any grading or excavation required for equipment travel during the course of construction as well as erosion control, access or haul road installation and removal, restoration, seeding and ground cover.
- D. The Contractor shall be responsible for damage to areas or items designated by the A/E to be protected. Repairs to, replacement of, or reparations for areas or items damaged shall be made at the Contractor's expense and to the satisfaction of the A/E before acceptance of the completed project.
- E. Any fences disturbed by the Contractor shall be repaired to a condition equal to or better than their original condition or to the satisfaction of the A/E at no additional cost.
- F. Contractor shall obtain written permission from property owners for use of any access other than ones located within rights-of-way. Written permission shall contain conditions for use and restoration agreements between property owner and Contractor. No additional compensation will be made for such access.
- G. All areas disturbed shall be restored to a condition equal to or better than their original condition and shall be graded to drain.
- H. The Contractor shall protect, replace or repair all damaged or destroyed property pins or other monumentation.

#### 3.02 PROTECTION OF EXISTING UTILITIES

- A. Contractor is responsible for locating and protecting existing utilities.
- B. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the A/E and secure instructions. Do not proceed with permanent relocation of utilities until instructions are received from the A/E.

### 3.03 TOPSOIL REMOVAL

- A. Remove the existing topsoil to a depth of 6 inches or to the depth encountered from all areas in which excavation will occur. The topsoil shall be stored in stockpiles, separate from the excavated material, if the topsoil is to be re-spread. Otherwise, material shall be disposed of off-site at the Contractor's expense.
- B. The contractor shall employ erosion control methods per specification 31 25 00 Erosion & Sediment Control for all stockpiled material.

### 3.04 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.

### 3.05 EXCAVATION

- A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.
- B. Excavation shall be performed as indicated on the plans or as directed by the A/E to the lines, grades, and elevations, and shall be finished to a reasonable smooth and uniform surface. During the process of excavation, the grade shall be maintained and surface shall be rolled so that it will be well drained at all times.

When solid rock is incurred in the excavation, the rock shall be removed to a minimum depth of 12 inches below the surface of the subgrade. Material unsatisfactory for subgrade foundation shall be removed to a depth specified to provide a satisfactory foundation. The portion so excavated shall be refilled with suitable material obtained from the grading operations or borrow area and thoroughly compacted by rolling. Material obtained from on-site grading operations must be approved by the A/E. For areas that do not require fill, scarify and compact to a depth of 6 inches.

Any removal, manipulation, aeration, replacement, and recompaction of suitable materials necessary to obtain the required density shall be considered as incidental to the construction operations, and shall be performed by the Contractor at no additional cost to the Owner.

No rock, stone, or rock fragments, larger than 2 inches in their greatest dimension will be permitted in the top 12 inches of the subgrade. No rock, stone, or rock fragments larger than 8 inches in their greatest dimension will be permitted in the remainder of the fill.

### 3.06 STABILITY OF EXCAVATIONS

- A. Comply with OSHA, local codes, ordinances, and requirements of agencies having jurisdiction.
- B. Slope sides of excavations to comply with OSHA, local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of



space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

- C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of thirty inches below final grade and leave permanently in place.

### 3.07 DEWATERING

- A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding Project Site and surrounding area. Provide erosion control methods for dewatering operations in conformance with Specification SP 31 25 00 Erosion & Sediment Controls.

Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

### 3.08 STORAGE OF EXCAVATED MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage. Provide erosion control measures as needed per specification SP 31 25 00 Erosion & Sediment Controls.

Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

### 3.09 EXCAVATION FOR STRUCTURES

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

For pile foundations, stop excavations from 6 inches to 12 inches above bottom of footing before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

### 3.10 EXCAVATION FOR PAVEMENTS

- A. Cut surface under pavements to comply with cross sections, elevations and grades as indicated.
- B. Areas to be Paved: After all excavation, undercutting, and backfilling has been completed, the subgrade shall be properly shaped and thoroughly compacted. The compactive effort shall include all areas beneath pavement and shall extend at least a minimum of 1 foot beyond the paving/berm limits. Compaction shall be in accordance with Table 31 20 00-1.
- C. Curb and Gutter, Sidewalks and Driveway Aprons: The subgrade shall be constructed true to grade and cross section as may be shown on the drawings. Compaction shall be in accordance with Table 31 20 00-1.
- D. All subgrade shall be graded and protected as to prevent an accumulation or standing water, and consequent subgrade saturation, in the event of rain.
- E. Grading Tolerances of Finished Surface: Earthwork shall conform to the lines, grades, and typical cross sections shown on the plans or as established by the A/E. Changes in grade shall be accomplished by smooth curves.

Shape subgrade under pavement and curb and gutter to within ½ inch of required subgrade elevations.

Finish pavement and curb and gutter to within ½ inch of required finish elevations.

Shape subgrade under sidewalks to within 0.10 foot of required subgrade elevations.

Finish sidewalks to within 0.10 foot of required finish elevations.

- F. Backfill of Curb and Gutter and Sidewalks: Immediately after the removal of forms for curb and gutter, sidewalks and driveways, the space between the back of the curb, sidewalks, and driveways shall be backfilled and smoothed off in a manner to prevent the accumulation of standing water.

### 3.11 TRENCH EXCAVATION FOR PIPES AND CONDUIT

- A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6 and a maximum of 12 inches of clearance on both sides of pipe or conduit, unless otherwise specified on the construction drawings.
- B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6 inch layer of crushed stone or gravel prior to installation of pipe.

For pipes or conduit less than 6 inches in nominal size, and for flat bottomed, multiple duct conduit units, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil or specified bedding.

For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with specified backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

### 3.12 EXCAVATING AND PLACING FOUNDATION DRAINAGE SYSTEM

- A. Excavate for foundation drainage system after subgrade material has been compacted but before drainage fill course has been placed. Provide a clear horizontal distance between drain pipe and trench wall on both sides not less than 2 times the diameter of the drain pipe, unless otherwise shown. Grade the bottom of trench excavations to required slope and compact to a firm, solid bed for drain system. Place and compact impervious fill material to raise low areas or where unsatisfactory bearing soil may occur.
- B. After concrete footings have been cured and forms removed, place impervious fill material on the subgrade adjacent to the bottom of the footing. Place and compact impervious fill to the dimensions indicated or, if not indicated, 6 inches deep and 12 inches wide.

Place a supporting layer of drainage fill material over compacted subgrade where drainage pipe is to be laid to the depth indicated or, if not indicated, to a compacted depth of not less than 3 inches, followed by a 6 inch layer of compacted filtering material below pipe.

Place sufficient width of filter fabric in trench to cover perimeter of drainage material plus overlap. Place a supporting layer of drainage fill material over filter fabric where drainage pipe is to be laid to the depth indicated or, if not indicated, to a compacted depth of not less than 2 inches.

- C. Lay drain pipe solidly bedded in drainage fill material. Provide full bearing for each pipe section throughout its length, to true grades and alignment, and continuous slope in the direction of flow.

Lay perforated pipe with perforations down and joints tightly closed in accordance with pipe manufacturer's recommendations. Provide collars and couplings as indicated in the drawings.

Provide recesses in the excavation bottom to receive bells for drain pipe having bell and spigot ends. Lay pipe with bells facing up the slope with spigot end entered fully into adjacent bell. Seal joint in accordance with local practices having jurisdiction.

- D. Test or check lines before backfilling to assure free flow. Remove obstructions, replace damaged components, and retest system until satisfactory.
- E. After testing of drain lines, place additional drainage fill material as follows:

At exterior perimeter drainage system, completely cover drain lines to a width of at least 6 inches on each side and 12 inches above top of pipe with material unless more coverage is indicated on the Drawings. Place material in layers not exceeding 3 inches in loose depth and compact each layer placed.

At under slab drainage system, provide a minimum of 6 inches on top of drains and 12 inches around sides of drains.

Unless otherwise indicated, backfill exterior perimeter drainage system with drainage fill material over filtering material to within 18 inches of indicated finished grade elevations.

Place drainage fill material over underslab drainage system (maximum 6 inch lifts) and compact.

- F. Apply impervious fill material over compacted drainage fill material at exterior perimeter drains, placing the material in layers not exceeding 6 inches in loose depth and thoroughly compacting each layer. Carry impervious fill to indicated finish elevations (except carry to 6 inches below finished grade where indicated to receive topsoil) and slope away from building perimeter.

### 3.13 BACKFILL AND FILL

- A. Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section unless indicated otherwise on the construction drawings.

Under grassed areas, use satisfactory excavated or borrow material.

Under walks and pavements, use base material, satisfactory excavated or borrow material, or a combination.

Under steps, use base material.

Under building slabs, use drainage fill material within 1' under slab, use select fill deeper than 1'.

Under piping and conduit and equipment, use select fill materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.

Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

Do not backfill trenches until tests and inspections have been made and backfilling is authorized by A/E. Use care in backfilling to avoid damage or displacement of pipe systems.

- B. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

- C. Backfill excavations as promptly as work permits, but not until completion of the following:

Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.

Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.

Removal of concrete formwork.

Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

Removal of trash and debris from excavation.

Permanent or temporary horizontal bracing is in place on horizontally supported walls.

### 3.14 PLACEMENT AND COMPACTION

- A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture condition to optimum moisture content, and compact to required depth and percentage of maximum density.

- B. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand operated tampers.
- C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or

conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

- E. Minimum Compaction Requirements: Compaction percentages are percentages of maximum dry density as determined by indicated ASTM Standards. Unless otherwise recommended by a Geotechnical Engineer and authorized by the A/E, the material shall be placed at plus or minus 3% of optimum moisture content.

<b>Table 31 20 00.1</b>	
<b>Minimum Compaction Limits</b>	
<b>Location</b>	<b>Density</b>
Beneath and within 5 feet of buildings	98% of the maximum dry density by ASTM D 698 (Standard Proctor), AASHTO T-99
Areas under roadway pavement surfaces, shoulders, sidewalks, and curb and gutter	98% of the maximum dry density by ASTM D 698 (Standard Proctor), AASHTO T-99
Under turf, sodded, planted, landscaped, or seeded non-traffic areas	95% of the maximum dry density by ASTM D 698, (Standard Proctor) AASHTO T-99

Compactive Efforts: If compaction efforts should fail to provide a stable subgrade, after subgrade materials have been shaped and brought to optimum moisture, such unstable materials shall be removed to the extent directed by either the Geotechnical Engineer or the A/E and replaced and compacted using new select material.

Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

### 3.15 GRADING

- A. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from building structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.

Walks: Shape surface of areas under walks to line, grade, and cross section, with finish surface not more than 0.10 foot above or below required subgrade elevation.

Pavements: Shape surface of areas under pavement to line, grade, and cross section, with finish surface not more than ½ inch above or below required subgrade elevation.

- C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10 foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

### 3.16 PAVEMENT BASE COURSE

- A. Base course consists of placing base material, in layers of specified thickness, over subgrade surface to support a pavement base course.
- B. During construction, maintain lines and grades including crown and cross slope.
- C. Place berms, shoulders, or extended base course as indicated on the construction drawings. Construct shoulder subgrade of acceptable soil materials, placed in such quantity to compact to thickness of each subgrade course layer. Compact and roll at least a 12 inch width of shoulder simultaneous with the compaction and rolling of each layer of subgrade course.
- D. Place base course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross section and thickness. Maintain optimum moisture content for compacting subgrade material during placement operations.

### 3.17 BUILDING SLAB DRAINAGE COURSE

- A. Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.
- B. Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross section and thickness. Maintain optimum moisture content for compacting material during placement operations.

When a compacted drainage course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

### 3.18 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

Perform field in place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.

Field in place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017. When field in place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Owner.

- C. Minimum Compaction Testing Frequency: A test group shall consist of compaction tests on each layer of fill and backfill material. One (1) test group shall be performed and summarized written results provided at the frequencies and locations as follows:

<u>Location:</u>	<u>Frequency:</u>
Buildings and structures	Every 5,000 square feet.
Roads, Drives	Every 300 feet of road, drive
Parking Lots	Every 10,000 square feet of pavement
Unpaved Areas	Every 20,000 square feet
Pipe Trench	Every 300 feet of trench

In the absence of a pre-construction Geotechnical investigation, the Geotechnical testing firm is to perform laboratory Proctor tests to establish a moisture-density relationship for all materials that are proposed to be used as fill.

Contractor shall give a 24-hour notice to Geotechnical testing firm when ready for Proctor, compaction, or subgrade testing and inspection.

Should any moisture-density test fail to meet specification requirements, the Contractor shall perform corrective work necessary to bring the material in compliance and retest the failed area at no additional cost to the Owner.

- C. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Owner.
- D. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

### 3.19 EROSION CONTROL

- A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction.
- B. As applicable, the Contractor shall comply with the requirements of the Ohio Environmental Protection Agency Construction Stormwater General Permit (as indicated in the Storm Water Pollution Prevention Plan), the Ohio Department of Natural Resources "Ohio's Standards for



Storm Water Management, Land Development and Urban Stream Protection”, and/or any local requirements; latest revision.

3.20 MAINTENANCE

- A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- D. Where settling is measurable or observable at excavated areas during general Project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal to Designated Areas on Owner's Property: Transport acceptable excess excavated material to designated soil storage areas on Owner's property. Stockpile soil or spread as directed by Owner.

Transport waste material, including unacceptable excavated material, trash, and debris to designated spoil areas on Owner's property and dispose of as directed.

- B. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.

Remove excess excavated material, trash, debris, and waste materials and dispose of it off Owner's property.

**END OF SECTION 31 20 00**

## SECTION 31 25 00 - EROSION & SEDIMENT CONTROL

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Soil erosion.
2. Water pollution control.

B. Related Sections:

1. Section 31 10 00 - Site Clearing.
2. Section 31 20 00 – Earth Moving.

#### 1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's data identifying product characteristics and limitations.
- B. Samples: Submit 12" x 12" sample of each type of silt fence to be used.

#### 1.3 REGULATORY REQUIREMENTS

- A. Comply with applicable Federal, State, and Local statutes and regulations.
- B. In the event of a conflict the more restrictive statutes or regulations shall govern.
- C. The Associate will arrange a field pre-construction conference with Contractor and regulatory agencies if required.

#### 1.4 ENVIRONMENTAL REQUIREMENTS

- A. Coordinate with permanent erosion control features to extent practical to ensure economical effective, and continuous erosion control throughout construction and post construction period.
- B. Include temporary control measures as required by statutes, regulations, Associate, and State Inspector to protect fish and wildlife, prevent soil erosion, and comply with other pollution control laws as art of Work of this Section.

#### 1.5 SITE CONDITIONS

- A. Schedule and perform Work to minimize amounts and times when soil erosion and water pollution could occur.
- B. Be responsible for executing the plan as prepared for this project. If the Contractor deviates from this plan without the necessary approvals or the Associate observes any unsatisfactory

construction procedures or operations, the Associate may suspend the performance of any construction until satisfactory conditions are corrected.

- C. Such suspension shall not be the basis of any claim by Contractor for additional compensation from the Owner nor for an extension of contract time.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Silt Fence (Filter Fabric Fence): Design, construct, and maintain in accordance with Local and State Standards and Specifications.
- B. Straw Bale: Design, construct, and maintain straw barriers in accordance with Local and State Standards and Specifications.
- C. Stakes: Wood, minimum 2 x 2 x 36 inches long.
- D. Erosion Control Matting: In accordance with ODOT Item 671 Erosion Control Mats, Type A, B, C, E, F, and I, as specified on the drawings.

## PART 3 - EXECUTION

### 3.1 GENERAL STATEMENT

- A. Proposed plan objectives: Minimize erosion and subsequent sedimentation caused by the construction activities outlined in project scope.
- B. Obey following guidelines during construction:
  - 1. Minimize the area and time of exposure.
  - 2. Save existing vegetation, especially trees.
  - 3. Install temporary or permanent measures to control stormwater runoff in order to protect soil bared by construction.
  - 4. Practice proper fine grading and excavation; hold line grading and excavation to a minimum.
  - 5. Establish temporary vegetation until such time that permanent vegetation can be established.
  - 6. Establish permanent vegetation as soon as possible and no later than 10 days after project completion.
  - 7. Lay suitable protection, such as erosion netting, fibermats, etc., over disturbed area when work will cease for a period greater than one day.

### 3.2 STORMWATER HANDLING

- A. Divert runoff from areas above the project site away from excavation areas, where possible.

- B. Control soil erosion and sedimentation created by stormwater which naturally flows across, over and/or through areas disturbed by construction by use of a sediment basin, straw bale barriers, or silt fences placed along the contour, and in accordance with the temporary erosion control details for disturbed areas perpendicular and parallel to the ground slope, as well as the TEMPORARY EROSION AND SEDIMENTATION CONTROLS portion of this Plan.
- C. Divert stormwater runoff from open excavations or trenches. If any trench or excavation dewatering or well point pumping is necessary, direct pump discharges to a dewatering sediment basin, whenever possible.

### 3.3 TEMPORARY EROSION AND SEDIMENTATION CONTROLS

- A. Control soil erosion and sedimentation during initial earthmoving by placing filter fabric fence on low side of the limit of area to be disturbed prior to engaging in any such activities.
- B. Use staked straw bale barriers and filter fabric fence to control soil erosion and sedimentation from entering streams during construction activities. Install temporary controls prior to earth disturbance whenever possible.
- C. Install temporary erosion controls for excavation as shown on either of the two typical details, Temporary Erosion Control Perpendicular to Slope and Temporary Erosion Control Parallel to Slope, as shown on Drawings, for whichever slope prevails.
- D. Be responsible for installing and maintaining temporary erosion controls for disturbed areas on this project in accordance with this report and the Erosion & Sediment Pollution Control Plans & Details provided in Contract Drawings.
- E. Where possible, stake straw bale barriers around perimeter of catch basin grates for the purpose of controlling eroded soil and sedimentation from entering the storm sewer inlets.
- F. Excavate a four-inch deep anchoring trench as wide as the bales. Place straw bales in the trench and stake. Place straw bales so that the twine holding the bales together is not in contact with the ground. Drive stakes a minimum 18 inches below ground elevation. Backfill and compact anchoring trench to a density equal to or greater than that of undisturbed site soils.
- G. Inspect straw bale barriers weekly or after every precipitation event, whichever is more frequent. If bales become ineffective, dislodged, clogged, or inoperative, repair or replace immediately. Remove accumulated sediments when their height reaches 1/3 of the minimum above ground height of straw bale barrier. Immediately repair undercutting or erosion of the anchor toe with compacted backfill materials.
- H. Place filter fabric fences on the contour. Extend both ends of a section of fence uphill, 45 degree angles, to the point that the bottom of the fence equals the top of the fence elevation.
- I. Excavate a 6 inch deep by 6 inch wide trench continuously along the bottom of fence. Lay bottom 6 inches of filter fabric fence in the trench and backfill with excavated material. Compact backfill material to a density equal to or greater than that of undisturbed soil.
- J. Inspect filter fabric fence weekly or after every precipitation event, whichever is more frequent. If filter fabric fence becomes ineffective, immediately repair and replace as

necessary. Remove accumulated sediments when their height reaches 1/2 of the above ground height of the fence. Immediately repair undercutting or erosion of the toe anchor with compacted backfill materials.

- K. Leave temporary erosion and sedimentation controls for improved surfaces in place until such time that permanent controls, paving, riprap, etc., are installed. Keep temporary erosion and sedimentation controls for unimproved surfaces in place until such time that a uniform 70 percent vegetative cover is established to stabilize the soil of disturbed area. Once acceptable cover is established, convert sediment basin to permanent detention basin; the details as provided on Drawings and these Specifications.

### 3.4 EXCAVATION FOR PIPELINES

- A. Excavate depth of trench for pipelines such that pipe in its installed position complies with the line and grades shown on Drawings, or with the line and grades established by A/E in field.
- B. In excavation for pipelines where made in open cut and where space permits, excavate trench banks from ground surface to a depth not closer than 1 foot above the top of the pipe to non-vertical and nonparallel planes.
- C. Do not permit trench side walls in pipe zone, defined as that trench area below a point 12 inches above the top of pipe in its installed position, to be other than vertical and parallel planes equidistant from the pipe centerline. Horizontal distance between the vertical planes: be no greater than outside diameter of pipe plus 24 inches nor less than outside diameter of pipe plus 12 inches.
- D. Where the available space does not permit and where existing or proposed above ground or underground structures may be endangered, excavate trench sides above the pipe zone to vertical and parallel planes. Horizontal distance between the vertical planes: be no greater than necessary to permit construction of pipeline with required sheeting, shoring, and bracing in place.

### 3.5 GRADING

- A. Before beginning excavation and filling, strip topsoil from areas to be affected to a depth of at least 6 inches and store at a location approved by Associate or Engineer. Excess topsoil shall be disposed of as discussed in the DISPOSAL OF EXCESS MATERIAL portion of these specifications. Place Filter Fabric Fence around low sides topsoil storage areas. Seed and mulch topsoil storage piles in accordance with SEEDING and MULCHING portions of this Plan.
- B. Prior to beginning excavation on any areas which currently have impervious surfaces, strip the impervious surface and dispose of it separately at an approved site as discussed in the DISPOSAL OF EXCESS MATERIAL portion of this Plan.
- C. After completion of the major construction work, replace topsoil as the upper layer of backfill to a depth of not less than 6 inches so that the final grade will be as required by the Drawings.
- D. In general slope grade away from the installed or existing structures to drainage ditches, storm sewer inlets, or culverts. Thoroughly loosen those areas which are not occupied by

structures or pavement by harrowing or discing and then rake by hand. Remove stones over 1&1/2 inches, rubbish, and debris. Uniformly space topsoil in piles and distribute by an approved method.

- E. Supply additional topsoil required over and above that salvaged from site in order to maintain a minimum of 6 inch depth over entire area defined above, if the area is to be seeded. Correct any surface irregularities to prevent formation of low places where surface water may pool. Do not place topsoil when the subgrade is frozen or when it is excessively wet or dry; do not handled when in a frozen or muddy condition.

### 3.6 VEGETATION

- A. Permanently seed, or if specified, sod grounds disturbed by operations necessary to complete the work for this project, unless occupied by structures or paved. Accomplished as soon as possible after construction and not later than 10 days.
- B. If seeding cannot be completed within the 10 day period due to weather conditions, mulch disturbed area with straw at rate of two bales per 1,000 sq. ft. Anchor straw with mulch netting according to manufacturer's recommendations or other appropriate means.
- C. Use temporary seeding to protect exposed land surfaces which will not be permanently protected for a period more than 10 days. Temporary vegetation will provide short-term rapid cover until permanent vegetation or other protection can be established.

### 3.7 TEMPORARY SEEDING

- A. Purpose of temporary cover: to provide short-term, rapid cover for control of runoff and erosion until permanent vegetation or other stabilization material can be established. Apply temporary cover on sediment producing areas where the period of exposure will be more than 10 days. Provide mulch cover for no less than two months' exposure.
- B. The site preparation and establishment of temporary cover shall be conducted according to the following guidelines:
  - 1. Install needed surface water control measures.
  - 2. Perform all cultural operations at right angles to the slope.
  - 3. Apply ground limestone according to test or at the rate of 100 lb./1000 sq. yd.
  - 4. Apply uniformly recommended analysis fertilizer according to soil test or 10-10-10 at the rate of 10 lb./1000 sq. yd.
  - 5. Work in lime and fertilizer to a depth of 4 inches using any suitable equipment.
  - 6. Temporary cover seed mixture: consist of 100 percent annual ryegrass; apply seed uniformly at rate of 10 lb./1000 sq.yd.
  - 7. Cover grass seed with 1/2 inches of soil with suitable equipment.
- C. Establish temporary grass cover in the following areas:

1. Seed stockpiles where soil stockpiles are to be exposed for a period greater than 20 days. When the soil stockpile will be exposed for a period greater than two (2) days, but less than twenty (20) days, cover stockpile with mulch or protective erosion control fabric.
2. Where waterways or ditches will be used to divert stormwater entering the work area, seed those waterways along the bottom, sides and 3 feet above and below the waterway. After construction is completed, seed or sod permanent waterways or ditches according to this Plan. Restore temporary waterways or ditches restored to natural grade and permanently seed according to this Plan.
3. Install waterways or ditches on slopes above the work area as indicated on the drawings or as needed to protect work area from stormwater runoff.
4. Where disturbed land surfaces will not be permanently protected for a period of more than ten (10) days.

### 3.8 PERMANENT GRASS COVER

#### A. Permanent Materials:

1. Topsoil: be acceptable friable loam; reasonably free of subsoil, clay lumps, brush, roots, weeds, and objectionable organic material stones, other inorganic material larger than two inches in any dimension, litter, and other materials harmful to plant growth.
2. Lime: be pulverized agricultural limestone containing a minimum of 85 percent total carbonates, ground so that at least 90 percent passes a No. 20 sieve and at least 50 percent passes a No. 100 sieve.
3. Commercial fertilizer: be a dry formulation of 10-20-20 analysis delivered in bags showing weight analysis and manufacturer's name; conform to the standards of the Association of Official Agricultural Chemists.
4. Slow-release Nitrogen Fertilizer: conform to Publication of 408, Section 804.2 (a).
5. Clean and fresh grass seed: be premixed packed in sealed bags with inspection tag showing net weight, composition of mix, date of germination tests and supplier's name.
6. Grass seed formula: in accordance with ODOT Construction and Material Specifications Class 1 Lawn Mixture Item 659.09.
7. Mulch: in accordance with ODOT Construction and Material Specifications Item 659.

#### B. Application:

1. Topsoil:
  - a. Apply topsoil to all areas to be turfed except slopes 2:1 or greater.
  - b. Prepare areas to receive topsoil by loosening soil to a depth of two inches. Remove stone and other foreign material two inches or larger.

- c. Spread and compact to a uniform six inch depth. Compact with a roller, weighing not over 120 lbs. per foot or roller, or by other acceptable methods.
  - d. Excess topsoil if any, becomes property of Owner; stockpile and stabilize as directed by Associate.
- 2. Lime and Fertilizer:
  - a. Apply pulverized agricultural limestone at a rate of 800 lbs. per 1000 S.Y.
  - b. Apply 10-20-20 analysis commercial fertilizer at a rate of 140 lbs. per 1000 S.Y.
  - c. Work lime and fertilizer into soil to two inch minimum depth by raking, discing, or harrowing.
- 3. Seeding:
  - a. Apply in accordance with ODOT Construction and Material Specifications Item 659.
- 4. Mulching:
  - a. Apply mulch within 48 hours after seeding in accordance with ODOT Construction and Material Specifications Item 659.
- C. Maintenance: Reseed areas and spots damaged or gullied or otherwise not showing a catch of grass. Repeat until a complete coverage is obtained. Keep seeded areas moist until 70 percent catch of grass is established. Mow areas where weeds are smothering new grass seedlings.

### 3.9 PROTECTION OF STREAM BANKS

- A. Clean and grub right-of-way according to above procedures.
- B. Earthmoving vehicles: Do not discharge any petroleum product or accumulated sediment to the stream.
- C. Store excavated soil on side of trench farthest from stream.
- D. If a pipe trench or excavation is dewatered during construction, remove water from pipe trench or keep excavation free of suspended sediment prior to entering any established drainage way. To remove suspended sediment, pump water into sediment basin or dewatering filter bag as discussed in Section 31 25 00 Erosion and Sediment Controls.
- E. Construction activities within surface water conveyance channels: require utilization of erosion control measures to protect stream banks and stream bed.

### 3.10 RESTORATION OF DRAINAGE CHANNELS, AND OTHER UNIMPROVED AREAS DISTURBED DURING CONSTRUCTION

- A. Hydromulch, fertilizer and seed unimproved areas disturbed during construction, including all drainage channels, as soon after completion of backhoe operations as is practicable;



establish a growth, and minimize pollution of streams from erodible fill, backfill, and other materials.

- B. Employ a satisfactory method of sowing using hydraulic seeders and other approved equipment where applicable.
- C. Drainage channel seeding mixture: consist of 45 percent winter rye, 45 percent tall fescue, and 10 percent perennial ryegrass, or an equivalent ryegrass base formula suitable for drainage channels. Apply drainage channel seed at rate of 3-5 lb./1000 sq. yd. Do seeding only at such times as climatic condition, temperature, and moisture are suitable for growth.
- D. Stabilize channels which cannot be stabilized with vegetation with jute matting or specifically designed products approved by Associate.

### 3.11 DISPOSAL OF EXCESS MATERIAL

- A. Disposal of excess material resulting from project construction.
- B. Excess material includes but may not be limited to: material resulting from excess material resulting from imbalance of cuts and fills; that material within the pipe zone; material deemed by Associate to be unsuitable for use as backfill material; excavated pavement material; excess material resulting from use of select backfill i.e., beneath improved surfaces; and excavated areas being replaced with a rock riprap lining.
- C. Secure an approved on-site waste area for disposal of these materials. If sufficient area is not available on-site, the contractor shall secure an approved off-site waste area for disposal of the excess materials.

### 3.12 FINAL GRADING

- A. *Areas Disturbed by Contractor's Operation.* Bring areas, including those areas used for storage of excavated material, equipment, etc., up to within 6 inches of final grade indicated on Drawings by methods specified. Where not indicated on Drawings, establish final grade equivalent to existing grade unless otherwise specified in field by A/E. In general slope grade away from the installed or existing structures to drainage ditches, storm sewer inlets or culverts. Thoroughly loosen those areas which are not occupied by structures or pavement by harrowing or discing and then rake by hand. Remove stones over 1 1/2 inches, rubbish, or debris. Uniformly space topsoil spaced in piles and distribute by an approved method.
- B. *Additional Topsoil Required.* Provide additional topsoil required over and above that salvaged from the site in order to maintain a minimum of 6 inches of depth over the entire area defined above if the area is to be seeded, or 4 inches of depth if the area is to be sodded or planted. Correct surface irregularities to prevent formation of low places where surface water may pool. Do not place topsoil when the subgrade is frozen or when it is excessively wet or dry; do not handle when in frozen or muddy condition.

### 3.13 CONTRACTOR'S ASSEMBLY/STOCK YARD

- A. Be responsible for securing and maintaining an assembly/stock yard for storing equipment and materials for use on this project. Provide such secured areas with their own erosion and

sedimentation control plans submitted to Ohio Environmental Protection Agency for review and approval if necessary.

- B. Be responsible for obtaining necessary approvals and permits required for such areas. Utilize and maintain such areas in accordance with laws, rules, and regulations of agencies having jurisdiction over the same.

### 3.14 IMPLEMENTATION OF THE PLAN

- A. The foregoing procedures and requirements of these Specifications are contractual obligations of Contractor performing actual construction work. Said requirements also apply to subcontractors working on the project.
- B. At such time, review in detail the final standards and specifications concerning seeding mixtures, cover requirements, barrier and sediment basin location, and any other such items as may be required to complete the Contract work in accordance with the rules and regulations of that agency, and in accordance with the laws, rules, and regulations of other authorities having jurisdiction over the required construction work.
- C. The requirements relative to temporary control measures, early permanent restoration, minimizing work areas, are of the most important factors affecting construction performance. In view of those circumstances, it is believed that this particular plan, on this particular project, will be implemented throughout the course of work.

### 3.15 USE OF THIS PLAN

- A. As previously stated herein, this Stormwater Pollution Prevention Plan has been prepared in response to and in accordance with certain rules and regulations promulgated by Ohio Environmental Protection Agency.
- B. The handling of stormwater, the topographic features described, the staging of earthwork, the temporary and permanent control measures, and the interpretations and opinions stated in the foregoing pages are to be used only for the purpose of eliminating, minimizing and/or controlling pollution of the streams and waterways from materials anticipated to be eroded from the earthwork to be disturbed as a result of construction of the Contract.

### 3.16 GENERAL NOTES

- A. Make periodic inspections to determine if proper vegetative growth is taking place. Reseed and mulch areas as needed.
- B. Remove and restore rock construction entrances when access provided by the entrance is no longer necessary.
- C. Store topsoil alongside the trench in a separate pile from other excavated material. Store no material within two feet of trench excavation.

**END OF SECTION 31 25 00**

## SECTION 32 12 16 - ASPHALT PAVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Asphaltic concrete paving.

B. Related Sections:

1. Section 31 20 00 – Earth Moving.
2. Section 32 17 23 – Pavement Markings.

#### 1.2 REFERENCES

- A. Construction and Material Specifications, Ohio Department of Transportation.
- B. ASTM D995 - Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

#### 1.3 SYSTEM PERFORMANCE

- A. Paving: Designed for circulation of automobiles, maintenance vehicles and delivery trucks.
- B. Refer to Drawings for thickness of various materials.

#### 1.4 SUBMITTALS

- A. Submit proposed design mix for each class of mix to Architect for review prior to commencement of work.

#### 1.5 ENVIRONMENTAL REQUIREMENTS

A. Quality Assurance - Manufacturer:

1. Conform with ASTM D995.

B. Quality Assurance - Installation:

1. Do not place asphalt when base surface temperature is less than 40 degrees F.
2. Do not place asphalt when base surface is wet or contains an excess of moisture which would prevent uniform distribution and required penetration.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Asphalt Concrete Surface Course Type I: In accordance with Section 441 Surface Course, of ODOT Construction and Material Specifications.
- B. Asphalt Concrete Intermediate Course Type II: In accordance with Section 441 Intermediate Course of ODOT Construction and Material Specifications.
- C. Bituminous Asphalt Concrete Base: In accordance with Section 301 of ODOT Construction and Material Specifications.
- D. Prime Coat: In accordance with Section 408 of ODOT Construction and Material Specifications.
- E. Tack Coat: In accordance with Section 407 of ODOT Construction and Material Specifications.
- F. Aggregate Base: In accordance with Section 304 of ODOT Construction and Material Specifications.

## 2.2 MIXING

- A. Maintain thorough and uniform mixture for each class of mix.
- B. Bring asphalt cement and mineral constituents to required temperature prior to mixing. Ensure aggregates are sufficiently dry so as to prevent foaming in mixture.
- C. Combine materials conforming to ASTM D995 and ODOT Construction and Material Specifications Item 401.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify compacted subgrade is dry and ready to support paving and imposed loads and is at proper gradients and elevations.
- B. Verify that frames of subsurface structures are properly set to meet final payment elevation.

### 3.2 PREPARATION

- A. Apply Bituminous Tack Coat in accordance with manufacturer's instructions to contact surfaces of curbs and subsurface structure frames.
- B. Abutting Existing Pavement: Where new paving abuts existing pavement saw cut existing pavement to its final depth to form straight lines or smooth curved lines to expose vertical face.
- C. Apply Bituminous Tack Coat to vertical face of existing pavement which interfaces new paving materials.
- D. Use fine aggregate to blot excess primer and tack coat materials.

### 3.3 PLACING SUBBASE

- A. Place aggregate material to compacted depth indicated.
- B. Spread, shape, and compact all aggregate material deposited on the subgrade during the same day.
- C. Extend subbase course minimum 8 inches beyond asphalt pavement width unless otherwise shown on Drawings.
- D. Add water during compaction to bring subbase course materials to approximate optimum moisture content, if necessary.
- E. Roll and thoroughly compact aggregate material with an approved roller.
- F. Properly compact areas adjacent to curbs, catch basins, manholes and other areas not accessible to rollers with mechanical or hand tamping devices.
- G. Using crown template, where required, of length and cut to required crown of finished surface of subbase, check the contour thereof at intervals of not more than 25 feet.
- H. Approved straightedges 10 ft. in length shall also be furnished and used for testing longitudinal irregularities in the surface of the subbase course.

### 3.4 TRANSPORTATION OF MATERIALS

- A. Transport asphalt concrete mixtures from mixing plant in trucks having tight and clean compartments.
- B. Provide covers over hot mixes when transporting to protect from weather and to prevent heat loss.
- C. During cold weather or for long-distance deliveries, provide insulation around truck bed surfaces.

### 3.5 PLACING ASPHALT PAVEMENT

- A. Place asphalt pavement within 24 hours of priming specified surfaces and in accordance with Sections 301 and 441. If more than 24 hours elapses between placement of intermediate and surface courses, Item 407 Tack Coat shall be applied at a rate of 0.10 gallons per square yard.
- B. Place each course to compacted thickness identified on Drawings.
- C. Place surface course within two hours of placing and compacting intermediate course.
- D. Ensure asphalt is minimum 245<sup>0</sup> F. immediately after placing and PRIOR to initial rolling.
- E. Initiate compaction as soon as pavement will bear equipment without checking or undue displacement.
- F. Compact pavement by rolling in accordance with ODOT Construction and Material Specifications Item 401. Do not displace or extrude pavement from position. Carry out compaction in three operations:

1. Breakdown Rolling.
  2. Second Rolling.
  3. Finish Rolling.
- G. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks. Keep roller wheels sufficiently moist so as not to pick up material.
- H. Perform hand tamping in areas not accessible to rolling equipment. Remove areas that are loose, broken, mixed with dirt, or otherwise defective, or show deficiency of bituminous material. Replace with fresh hot mixture and compact to conform to adjacent area.
- I. Line painting and marking is provided under provisions of Section 32 17 23.

### 3.6 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 20 foot straight edge.
- B. Compacted Scheduled Thickness: Within 1/8 inch of design thickness.
- C. Variation from True Elevation:
1. Intermediate Course: 1/2 inch in 10 feet.
  2. Surface Course: 1/4 inch in 10 feet.
- D. Depressions, retaining or ponding water, mounds in pavement, and ridges at joints will be cause for rejection.

### 3.7 FIELD QUALITY CONTROL

- A. Perform field testing under provisions of ODOT Item 448, except that density tests are to be performed each day that asphalt is placed.
- B. Test compacted thickness of base, intermediate and surface course during each day of asphalt placement in compliance with ODOT Construction and Material Specifications Item 401.
- C. If compacted thickness is less than specified tolerances, then provide additional material and roll into hot bituminous paving course. If bituminous paving course falls below specified temperature, then entire bituminous course shall be removed and new materials provided at no additional cost to Owner.

### 3.8 CLEANING

- A. After completion of paving operations, clean surfaces of excess and spilled asphalt materials to satisfaction of Architect.

### 3.9 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 3 days, or until properly cooled and resistant to wheel damage.

- B. Provide barricades and warning devices in a manner sufficient to protect pavement and general public.
- C. Cover openings of structures in area of paving until permanent coverings are placed.

**END OF SECTION 32 12 16**





## SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

### PART 1- GENERAL

#### 1.01 SUMMARY

##### A. Section Includes:

1. Fence framework, fabric, and accessories.
2. Manual gates and related hardware.

##### B. Related Sections:

1. Division 0 – Procurement & Contracting Requirements
2. Division 1 – General Requirements
3. Division 3 – Concrete.

#### 1.02 REFERENCES

- A. ASTM A121 – Specification for Metallic-Coated Carbon Steel Barbed Wire
- B. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized Coatings on Iron and Steel Products
- C. ASTM A392 – Specification for Zinc-Coated Steel Chain-Link Fence Fabric
- D. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- E. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- F. ASTM A824 – Specification for Metallic-Coated Steel Marcellled Tension Wire for Use with Chain Link
- G. ASTM F552 – Standard Terminology Relating to Chain Link Fencing
- H. ASTM F567 – Standard Practice for Installation of Chain Link Fence
- I. ASTM F626 – Specification for Fence Fittings
- J. ASTM F668 – Specification for Polymer Coated Chain Link Fence Fabric
- K. ASTM F900 – Specification for Industrial and Commercial Swing Gates
- L. ASTM F934 – Specification for Standard Colors for Polymer-Coated Chain Link

- M. ASTM F1043 – Specification for Strength and Protective Coatings of Metal Industrial Chain Link Fence Framework
- N. ASTM F1083 – Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
- O. ASTM F1184 – Specification for Industrial and Commercial Horizontal Slide Gates
- P. ASTM F1664 – Specification for Poly (Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Tension Wire Used with Chain-Link Fence
- Q. ASTM F1665 – Specification for Poly (Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used with Chain-Link Fence
- R. ASTM F1910 – Specification for Long Barbed Tape Obstacles
- S. ASTM F1911 – Standard Practice for Installation of Barbed Tape
- T. ASTM F2200 – Specification for Automated Vehicular Gate Construction
- U. CLFMI SFR 2445 – Security Fence Recommendations
- V. CLFMI CLF TPO211 – Tested and Proven Performance of Security Grade Chain Link Fence Systems
- W. CLFMI WLG2445 – Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing
- X. UL 325 – Door, Drapery, Gate, Louver and Window Operators

### 1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design chain-link fences and gates, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Chain-link fence and gate framework shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7:
  - 1. Minimum Post Size: Determine according to ASTM F 1043 for framework up to 12 feet (3.66 m) high, and post spacing not to exceed 10 feet (3 m).
  - 2. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified and on the following:
    - a. Wind Loads: In compliance with Building Code and fence/post manufacturer's recommendations.
    - b. Exposure Category: In conformance with location of installation.
    - c. Fence Height: As shown on the drawings and in conformance with CLFMI standards.

d. Material Group: IA, ASTM F 1043, Schedule 40 steel pipe.

C. Lightning Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

#### 1.04 SUBMITTALS

A. Submit under provisions of Section 01 33 00 – Submittal Procedures.

B. Certifications: Manufacturer's material certifications in compliance with current ASTM specifications.

C. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

1. Fence and gate posts, rails, and fittings.

2. Chain-link fabric, reinforcements, and attachments.

3. Accessories: Barbed wire.

4. Gates and hardware.

5. Gate operators, including operating instructions.

6. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

1. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: Prepared on Samples of size indicated below:

1. Polymer-Coated Components: In 6-inch (150-mm) lengths for components and on full-sized units for accessories.

E. Delegated-Design Submittal: For chain-link fences and gate framework indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Operation and Maintenance Data: For the following to include emergency operation, operation, and maintenance manuals:

1. Polymer finishes

2. Gate hardware

3. Gate operator

1.05 QUALITY ASSURANCE

A. Installation: Conform to ASTM F567.

B. Manufacturer: Company with five consecutive years of experience in metal fencing and gates.

C. Installer: Company with three consecutive years of experience in installing fencing and gate systems.

D. Submit documentation of experience if requested by Architect.

E. Testing Agency Qualifications: For testing fence grounding. Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

F. 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.

G. Pre-installation Conference: Conduct conference at Project site. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.

1. Review sequence of operation for each type of gate operator.

2. Review coordination of interlocked equipment specified in this Section and elsewhere.

3. Review required testing, inspecting, and certifying procedures.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of gate operators and controls.

- b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 CONCRETE MIX

- A. Concrete: As specified in Division 3.

### 2.02 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:
  1. Fabric Height: As indicated on drawings.
  2. Steel Wire Fabric: Wire with a diameter of 0.192 inch.
  3. Mesh Size: 2 inches.
  4. Zinc-Coated Fabric: ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. (366 g/sq. m) with zinc coating applied before weaving.
  5. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.
- B. Selvage: Knuckled at both selvages.

### 2.03 FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. *SS40 posts and rails may be substituted in lieu of Schedule 40.* Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:
  1. Fence Height: As indicated on drawings.
  2. Heavy Industrial Strength: Material Group IA, round steel pipe, Schedule 40.
    - a. Line Post: 1.9 inches (48 mm) in diameter.
    - b. End, Corner and Pull Post: 2.375 inches (60 mm) in diameter.
  3. Horizontal Framework Members: top and bottom rails complying with ASTM F 1043.
    - a. Top Rail: 1.66 inches (42 mm) in diameter.
  4. Brace Rails: Comply with ASTM F 1043.

5. Metallic Coating for Steel Framing:
  - a. Type A, consisting of not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating per ASTM A 653/A 653M.
  - b. Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
  - c. External, Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- (0.0076-mm-) thick, zinc-pigmented coating.
  - d. Type C, Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. (0.55-kg/sq. m) coating.
  - e. Coatings: Any coating above.

#### 2.04 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177-inch- (4.5-mm-) diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824, with the following metallic coating:
  1. Type II, zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:
    - a. Class 3: Not less than 0.8 oz./sq. ft. (244 g/sq. m) of uncoated wire surface.
    - b. Class 4: Not less than 1.2 oz./sq. ft. (366 g/sq. m) of uncoated wire surface.
    - c. Class 5: Not less than 2 oz./sq. ft. (610 g/sq. m) of uncoated wire surface.
    - d. Matching chain-link fabric coating weight.
  2. Type III, Zn-5-Al-MM alloy with the following minimum coating weight:
    - a. Class 60: Not less than 0.6 oz./sq. ft. (183 g/sq. m) of uncoated wire surface.
    - b. Class 100: Not less than 1 oz./sq. ft. (305 g/sq. m) of uncoated wire surface.
    - c. Matching chain-link fabric coating weight.

#### 2.05 SWING GATES

- A. General: Comply with ASTM F 900 for gate posts and single swing gate types.
  1. Gate Leaf Width: As shown on the drawings or in conformance with CLFMI standards.
  2. Gate Fabric Height: As shown n the drawings and in conformance with CLFMI standards.

B. Pipe and Tubing:

1. Zinc-Coated Steel: Comply with ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framing.
2. Aluminum: Comply with ASTM B 429/B 429M; mill finish.
3. Gate Posts: Round tubular steel.
4. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Welded or assembled with corner fittings.

D. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame 12 inches to attach barbed wire assemblies.

E. Hardware:

1. Hinges: 180-degree inward swing.
2. Latches permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Lock: furnished in lieu of gate latch.

2.06 FITTINGS

A. General: Comply with ASTM F 626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
2. Rail Clamps: Line and corner boulevard clamps for connecting bottom rails in the fence line-to-line posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel or Aluminum, length not less than 2 inches (50 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.



- H. Barbed Wire Arms: Pressed steel or cast iron, with clips, slots, or other means for attaching strands of barbed wire, integral with post cap; for each post unless otherwise indicated, and as follows:
  - 1. Provide line posts with arms that accommodate top rail or tension wire.
  - 2. Provide corner arms at fence corner posts, unless extended posts are indicated.
  - 3. Type I, single slanted arm.
- I. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
  - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
    - a. Hot-Dip Galvanized Steel: 0.106-inch- (2.69-mm-) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- J. Finish:
  - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. (366 g /sq. m) zinc.
    - a. Polymer coating over metallic coating.
  - 2. Aluminum: Mill finish.

## 2.07 BARBED WIRE

- A. Steel Barbed Wire: Comply with ASTM A 121, for two-strand barbed wire, 0.099-inch- (2.51-mm-) diameter line wire with 0.080-inch- (2.03-mm-) diameter, four-point round barbs spaced not more than 5 inches (127 mm) o.c.
  - 1. Zinc Coating: Type Z, Class 3.

## 2.10 FENCE GROUNDING

- A. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
  - 1. Material above Finished Grade: Copper.
  - 2. Material on or below Finished Grade: Copper.
  - 3. Bonding Jumpers: Braided copper tape, 1 inch (25 mm) wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.
- B. Connectors and Grounding Rods: Comply with UL 467.
  - 1. Connectors for Below-Grade Use: Exothermic welded type.
  - 2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches (16 by 2440 mm).

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A. Verify exact location of fencing with Owner's Representative prior to installation.

#### 3.02 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- B. Provide fence to heights and locations as indicated on drawings.
- C. Space line posts at intervals shown on drawings, or if not shown at intervals not exceeding 10 feet.
- D. Set posts plumb, in concrete footings as indicated and detailed on drawings.

Make footing diameter a minimum of 12 inches for line posts and 15 inches for all other posts.

- E. Provide 18 feet minimum top rail through line post tops and splice with 7 inch long rail sleeves. Attach bottom rail to various types of posts using manufacturer's recommended clamps, fittings and fasteners.
- F. Install bottom rail around entire perimeter of fence.
- G. Stretch fabric between terminal posts. Position bottom of fabric 2 inches above finished grade.
- H. Fasten fabric to following components with wire ties at following spacing.
  - 1. Line posts: 12 inches o.c.
  - 2. Top and bottom rails: 24 inches o.c.
- I. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- J. Install gates with fabric to match fence. Install gate hardware.
- K. Provide framework members of minimum sizes as recommended by manufacturer if fencing spans and heights vary from sizes indicated in Part 2 of this Section.

#### 3.03 ADJUSTING AND CLEANING

- A. Adjust and clean materials under provisions of Section 01 73 00 - Execution.
- B. Adjust hardware and materials as necessary for proper operation of gate.
- C. Remove debris and clean fencing work area. Remove excess concrete debris.

**END OF SECTION 32 31 13**



SECTION 32 92 19 - SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Includes:

1. Seeding grass.
2. Soil amendments.
3. Repair of damaged grass areas.

B. Related Sections:

1. Section 31 20 00 – Earth Moving

1.2 QUALITY ASSURANCE

A. Mix seed by certified dealer with tag bearing dealer's guaranteed statement of composition and percentages of purity and germination of each variety attached to each seed bag or container upon arrival at site.

B. Reject each seed bag without dealer's tag.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Submit tags accompanying seed bearing statement of composition and percentages of purity and germination.

C. Manufacturer's guaranteed statement of fertilizer analysis and warranty, or manufacturer's certificate of compliance covering analysis.

1.4 TIME OF PLANTING

A. Spring: Between March 15 and June 15.

B. Fall: Between September 1 and October 15.

C. Exceptions: May be granted in writing by Architect upon receipt of written request by Contractor.

1.5 LIMITATIONS

A. Seeding shall not take place, even during specified times, when weather conditions would negate germination or damage sprouting seed, or on days with wind speed greater than 10 mph.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver lime, fertilizer, and seed in original unopened containers or bags. Give 2 days notice so unopened materials may be met and checked.
- B. Store materials where directed by Owner's Representative.
- C. Protect materials to prevent contamination from subsoil clay, stones, leaves, branches, garbage, and other debris.
- D. Delivery: Deliver to site in original unopened containers. Fertilizer shall not have been exposed to rain or wet conditions prior to delivery and shall be protected while stored on site. Do not store fertilizer in direct contact with ground.

PART 2 - PRODUCTS

2.1 FERTILIZER AND LIME

- A. Standard commercial fertilizer complying to applicable Federal and State laws and in accordance with Section 659.08 of ODOT Construction and Material Specifications.
- B. Certification, Warranty: Provide certification and warranty bearing manufacturer's guaranteed analysis at time of delivery to site. Label shall also state make-up of nitrogen and probable (expected) life of controlled-release nitrogen nutrients; or Manufacturer or Contractor shall warrant life of nitrogen nutrients in writing.

2.2 MULCH

- A. Wheat straw or oats straw: Free from mature seed-bearing stalks and roots of non-specified grasses or weeds.
- B. Wood cellulose fiber: Having no growth or germination inhibiting factors, and an equilibrium air dry moisture content at time of manufacture of 12 percent. The wood cellulose fiber shall disperse rapidly in water to form a homogeneous slurry and remain in same state when agitated in hydraulic mulching unit. Acceptable manufacturer is Weyerhaeuser Company, or approved equal.

2.3 ACCESSORY MATERIALS

- A. Inoculant: Commercial product for treating leguminous seed consisting of suitable carrier containing a culture of nitrogen-fixing bacteria for seed to be inoculated. Do not use inoculant later than date indicated on container.
- B. Weed Killer: Systemic type; Round-up by Monsanto Co., or approved equal.
- C. Water: Potable.
- D. Equipment: Hand tools, hoses, machinery and equipment normal to trade. Do not use roller weighing more than 100 pounds per foot of width.

2.4 SEED MIXTURES

- A. Grass Seed Name: ODOT Urban Seed Mix

### PART 3 - EXECUTION

#### 3.1 TOPSOIL PREPARATION

- A. Spreading: Harrow and hand rake as necessary to spread topsoil. Topsoil surface shall be true lines and gradients, free from unsightly variations, humps, ridges and depressions.
- B. Cleaning: Remove stones over 2 inches in any dimension, and stiff clods of topsoil along with items disallowed by topsoil material specification.
- C. Rolling: Use lawn roller to settle topsoil and establish firm surface; fill in low spots.

#### 3.2 GRASS SEEDING

- A. Fertilizer: Apply standard commercial fertilizer per ODOT 659.04 and work same into upper 1 inch of topsoil by hand rake or other approved method.
- B. Seed Application: Rate: 4.5 pounds/1,000 sq.ft.
- C. Sow grass seed mixture in two equal quantities, sowing one quantity in one direction and the second quantity at right angles to the first with mechanical spreader.
- D. Rake to cover seed no deeper than 1/4 inch. Lightly roll and mulch.

#### 3.3 MULCH

- A. Rate for grass seed areas:
  - 1. Wheat or Oats Straw - 100 lbs./1000 sq.ft.
  - 2. Wood Cellulose Mulch - 30 lbs./1000 sq.ft.
- B. Stabilization: Ensure mulch is stabilized until grass is established. Cleanup mulch which has been wind blown or otherwise destabilized by contractor within 2 days. After 2 days, Owner will have cleanup done by others and same shall be a legitimate deduction from amount owed contractor.

#### 3.4 REPAIR DAMAGED GRASS AREAS

- A. Repair all damaged existing grass areas due to construction activities.
  - 1. Bring disturbed areas to smooth finished grade matching adjacent contours.
  - 2. Add new topsoil to existing to bring to a 6 inch depth.
  - 3. Sow with specified seed mixture.
  - 4. Provide same maintenance and guarantee as new grass areas throughout plan.

#### 3.5 CLEAN UP

- A. Remove all topsoil fertilizer, lime, and other debris from all paved areas.

3.6 MAINTENANCE AND GUARANTEE

- A. Contractor shall re-visit the site between September 1 and October 15 to inspect the site and reseed and/or repair any areas as needed.

**END OF SECTION 32 92 19**

SECTION 33 10 00  
WATER UTILITIES

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 piping and specialties for combined potable-water and fire-protection water service outside the building.
- B. Related Sections include the following:
  - 1. Division 21 Sections for fire-protection piping inside the building.
  - 2. Division 22 Section "Water Distribution Piping" for potable-water piping inside the building.
  - 3. Section 28 31 00 Fire Detection and Alarm Systems

1.3 DEFINITIONS

- A. The following are industry abbreviations for plastic and rubber materials:
  - 1. NP: Nylon.
  - 2. PE: Polyethylene.
  - 3. PP: Polypropylene.
  - 4. PTFE: Polytetrafluoroethylene.
  - 5. PVC: Polyvinyl chloride.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:
  - 1. Combined Potable-Water and Fire-Protection Water Service: 160 psig (1100 kPa).
  - 2. Potable-Water Service: 160 psig (1100 kPa).
  - 3. Fire-Protection Water Service: 150 psig (1035 kPa).

1.5 SUBMITTALS

- A. Product Data: For the following:



1. Pipe and fittings.
  2. Flexible pipe fittings.
  3. Valves.
  4. Fire hydrants.
- B. Record Drawings: At Project closeout of installed water-service piping according to Division 1 Section "Contract Closeout."
- C. Test Reports: As specified in "Field Quality Control" Article in Part 3.
- D. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.
- E. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1. Include data for the following:
1. Valves.
  2. Fire hydrants.

#### 1.6 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- B. Comply with requirements of utility supplying water. Include tapping of water mains and backflow prevention.
- C. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.
- D. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.
- E. Comply with standards of authorities having jurisdiction for fire-protection water-service piping. Include materials, hose threads, installation, and testing.
- F. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," for materials, installations, tests, flushing, and valve and hydrant supervision.
- G. Comply with ASTM F 645, "Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems."
- H. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated devices.

- I. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.
- J. Listing and Labeling: Provide electrically operated specialties and devices specified in this Section that are listed and labeled.
  - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
  - 1. Ensure that valves are dry and internally protected against rust and corrosion.
  - 2. Protect valves against damage to threaded ends and flange faces.
  - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
  - 1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.
  - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping 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.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

#### 1.8 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations

or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

#### 1.9 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with utility company.
- B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.
- C. Coordinate piping materials, sizes, entry locations, and pressure requirements with building fire-protection water piping.
- D. Coordinate with other utility work.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Drilling-Machine, Sleeves, and Corporation Stops:
    - a. Ford Meter Box Co., Inc.
    - b. Grinnell Corp.; Mueller Co.; Water Products Div.
    - c. Lee Brass Co.
  - 2. Bronze Corporation Stops and Valves:
    - a. Ford Meter Box Co., Inc.
    - b. Grinnell Corp.; Mueller Co.; Water Products Div.
    - c. Lee Brass Co.
    - d. Master Meter, Inc.
    - e. McDonald: A.Y. McDonald Mfg. Co.
    - f. Red Hed Manufacturing Co.
    - g. Watts Industries, Inc.; James Jones Co.
  - 3. Tapping Sleeves and Valves:
    - a. American Cast Iron Pipe Co.; Waterous Co.

- b. East Jordan Iron Works, Inc.
  - c. Grinnell Corp.; Mueller Co.; Water Products Div.
  - d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa)
  - e. McWane, Inc.; Kennedy Valve Div.
  - f. United States Pipe & Foundry Co.
4. Gate Valves:
- a. Mueller Co.; Water Products Div.
5. Indicator Posts and Indicator Gate Valves:
- a. American Cast Iron Pipe Co.; American Flow Control Div.
  - b. American Cast Iron Pipe Co.; Waterous Co.
  - c. Grinnell Corp.; Grinnell Supply Sales Co.
  - d. Grinnell Corp.; Mueller Co.; Water Products Div.
  - e. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa)
  - f. McWane, Inc.; Kennedy Valve Div.
  - g. Nibco, Inc.
  - h. Penn-Troy Machine Co.
  - i. Stockham Valves & Fittings, Inc.
  - j. United States Pipe & Foundry Co.
6. Dry-Barrel, Post Fire Hydrants:
- a. Mueller Co.; Water Products Div.
  - b. American Cast Iron Pipe Co.; American Flow Control Div.
  - c. Clow Water Products
- 2.2 PIPES AND TUBES
- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
  - B. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, Class 52, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.

- C. Polyvinyl Chloride Pipe: 4" to 12", AWWA C900, DR18; 14" or larger, AWWA C905, Fittings: AWWA C153, Ductile Iron; Joints: AWWA C111, Trace wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "water service" in large letters.
- D. *High Density Polyethylene (HDPE): AWWA C901 (3/4" – 3"), AWWA C906 (4"-54"), DR11, NSF –PW (61), PE 3408 HDPE meeting ASTM cell classification ASTM D3350.*
  - 1. *HDPE Joints: ASTM D2683 (socket), ASTM D3261 (fusion)*
  - 2. *Use butt fusion joining technique for joining pipe segments installed by HDD.*
  - 3. *When joining HDPE pipe at ends of directional drilling runs fusion bond to the adjacent pipe section.*
  - 4. *Mechanical Couplings are not permitted for joining of directional drilled pipe sections.*

## 2.3 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Ductile-Iron, Mechanical-Joint Fittings: AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
- C. Ductile-Iron, Deflection Fittings: Compound coupling fitting with sleeve and flexing sections, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include 250-psig (1725-kPa) minimum working-pressure rating; cement-mortar lining or epoxy, interior coating according to AWWA C550; deflection of at least 20 degrees (0.34 radians); and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

## 2.4 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Refer to Division 2 Section "Utility Materials" for commonly used joining materials.
- C. Ductile-Iron Piping: The following materials apply:
  - 1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.
  - 2. Mechanical Joints: AWWA C153 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
- D. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.
  - 1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47 (ASTM A 47M), malleable iron; or ASTM A 536, ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

## 2.5 PIPING SPECIALTIES

- A. Flexible Connectors for Nonferrous, Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends; brazed to hose.
- B. Flexible Connectors for Ferrous Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1 threaded steel pipe nipples or ASME B16.5 steel pipe flanges; welded to hose.
- C. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.
  1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
  2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C). Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
  3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum pressure to suit system pressures.
  4. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
    - a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure to suit system pressures.
  5. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
  6. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig (2070-kPa) working pressure at 225 deg F (107 deg C).

## 2.6 PE ENCASUREMENT

- A. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

## 2.7 VALVES

- A. Non-rising-Stem, Resilient-Seated Gate Valves, 3-Inch NPS (DN80) and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig (1380-kPa) minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.
- B. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches (125 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
  - 1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.
- C. Indicator Posts: UL 789, FM-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve.
- D. Curb Stops: Bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet to match service piping material.
- E. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER," and bottom section with base of size to fit over curb-stop and barrel approximately 3 inches (75 mm) in diameter.
  - 1. Provide steel tee-handle shutoff rod with each service box. Include tee handle with one pointed end, stem of length to operate curb stop, and slotted end fitting curb-stop head.
- F. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.
  - 1. Tapping Sleeve: Cast- or ductile-iron, 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical-joint ends with rubber gaskets or sealing rings in sleeve body. Include sleeve matching size and type of pipe material being tapped and of outlet flange required for branch connection.
- G. Service Clamps and Corporation Stops: Complete assembly, including service clamp, corporation stop, and bolts and nuts. Include service clamp and stop compatible with drilling machine.
  - 1. Service Clamp: Stainless Steel with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.
  - 2. Corporation Stops: Bronze body and ground-key plug, with AWWA C800 threaded inlet and outlet matching service piping material.
  - 3. Manifold: Copper with 2 to 4 inlets as indicated or required by the utility owner, with ends matching corporation stops and outlet matching service piping.
- H. Ball Valves: AWWA C507, Class 250. Include interior coating according to AWWA C550.

- I. Butterfly Valves: AWWA C504, with 150-psig (1035-kPa) working-pressure rating. Include interior coating according to AWWA C550.
- J. Butterfly Valves: UL 1091, with 175-psig (1200-kPa) working-pressure rating.
- K. Check Valves: AWWA C508, with 175-psig (1200-kPa) working-pressure rating. Include interior coating according to AWWA C550.
- L. Check Valves: UL 312, with swing clapper and 175-psig (1200-kPa) working-pressure rating.

## 2.8 FIRE HYDRANTS

- A. Description: Cast-iron body, compression-type valve, opening against pressure and closing with pressure, 6-inch (DN150) mechanical-joint inlet, and 150-psig (1035-kPa) minimum working-pressure design.
- B. Watch Valve: Each hydrant setting shall include one 6 inch diameter watch valve between the water main and the hydrant.
- C. Outlet Threads: NFPA 1963, with external National Standard Thread (Verify size and thread used by local fire department before ordering) Include cast-iron caps with steel chains.
- D. Operating and Cap Nuts: Pentagon 1-1/2 inch (40 mm) point to flat. Verify with Fire Dept.
- E. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
- F. Exterior Finish: Two coats of Red alkyd-gloss enamel paint. Verify paint color with local Fire Dept.
- G. Dry-Barrel Fire Hydrants: AWWA C502, two 2-1/2-inch National Standard Thread (DN65) and one 4-1/2-inch National Standard Thread (DN115) outlets, 4 1/2-inch (133-mm) main valve or larger, drain valve, and 6-inch NPS (DN150) ductile iron mechanical-joint inlet. Include 200-psig (1725-kPa) minimum working-pressure design and interior coating according to AWWA C550. Contractor to verify type, outlet size and thread with Local Fire Department and Village Water Department prior to ordering hydrants.

## 2.9 ANCHORAGES

- A. Clamps, Straps, and Washers: stainless steel.
- B. Rods: stainless steel.
- C. Bolts: stainless steel.
- D. Concrete Thrust Blocking: Portland cement concrete mix, 3000 psig (20.7 MPa).
  - 1. Cement: ASTM C 150, Type I.
  - 2. Fine Aggregate: ASTM C 33, sand.
  - 3. Coarse Aggregate: ASTM C 33, crushed gravel.



4. Water: Potable.

## 2.10 IDENTIFICATION

- A. Refer to Division 2 Section "Earthwork" for underground warning tape materials.
- B. Install detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."
- C. Nonmetallic Piping Label: Engraved, plastic-laminate label at least 1 by 3 inches (25 by 75 mm), with caption "CAUTION--THIS STRUCTURE HAS NONMETALLIC WATER-SERVICE PIPING," for installation on main electrical meter panel.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Refer to Division 2 Section "Earthwork" for excavation, trenching, and backfilling.
- B. Refer to Division 2 Section "Hot-Mix Asphalt Paving" for cutting and patching of existing paving.
- C. Refer to Division 2 Section "Portland Cement Concrete Paving" for cutting and patching of paving.

### 3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- C. Do not use flanges or keyed couplings for underground piping.
  1. Exception: Piping in boxes and structures, but not buried, may be joined with flanges or keyed couplings instead of joints indicated.
- D. Flanges, keyed couplings, and special fittings may be used on aboveground piping.
- E. Potable Water-Service Piping: Use the following:
  1. 4-Inch NPS (DN100): Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
  2. 4-Inch NPS (DN100): Copper tube, Type K (Type A); copper fittings; and soldered joints.
  3. 4-Inch NPS (DN100): Copper tube, Type L (Type B); copper fittings; and soldered joints.
  4. 6-Inch NPS (DN150): Ductile-iron, push-on-joint pipe; ductile-iron, mechanical joint fittings; and gasketed joints.

5. 5- and 6-Inch NPS (DN125 and DN150): Copper tube, Type K (Type A); copper fittings; and brazed joints.
  6. 5- and 6-Inch NPS (DN125 and DN150): Copper tube, Type L (Type B); copper fittings; and brazed joints.
  7. 8-Inch NPS (DN200): Ductile-iron, push-on-joint pipe; ductile-iron, mechanical joint fittings; and gasketed joints.
- F. Fire-Protection Water-Service Piping: Use the following:
1. 4- to 8-Inch NPS (DN100 to DN200): Ductile-iron, push-on-joint pipe; ductile-iron, mechanical joint fittings; and gasketed joints.
  2. 10- and 12-Inch NPS (DN250 and DN300): Ductile-iron, push-on-joint pipe; ductile-iron, mechanical joint fittings; and gasketed joints.
- G. Combined Potable-Water and Fire-Protection Water-Service Piping: Use the following:
1. 6- to 12-Inch NPS (DN150 to DN300): Ductile-iron, push-on-joint pipe; ductile-iron, mechanical joint fittings; and gasketed 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. Underground Valves, 3-Inch NPS (DN80) and Larger: AWWA C509 gate valves, non-rising stem, with valve box.

### 3.4 JOINT CONSTRUCTION

- A. Refer to Division 2 Section "Utility Materials" for basic piping joint construction.
- B. Ductile-Iron Piping, Gasketed Joints: According to AWWA C600.
- C. Ductile-Iron Piping, Gasketed Joints for Fire-Service Piping: According to UL 194 and AWWA C600.
- D. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.
- E. Threaded Joints: Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape or joint compound, and apply wrench to fitting and valve ends into which pipes are being threaded.
- F. Ductile-Iron, Keyed-Coupling Joints: Cut-groove pipes. Assemble joints with keyed couplings, gaskets, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

- G. Copper Tubing, Brazed Joints: According to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
- H. Copper Tubing, Soldered Joints: According to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
- I. Copper Tubing, Soldered Joints: According to CDA's "Copper Tube Handbook."
- J. PVC Piping, Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.

### 3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings 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.
- B. Install piping at indicated slope.
- C. Install components with pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:

### 3.6 SERVICE ENTRANCE PIPING

- A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.
  - 1. Terminate water-service piping 5 feet outside building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as compatible for piping material. Make connections to building water piping systems when those systems are installed.
- B. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- D. Anchor service-entry piping to building wall.

### 3.7 PIPING INSTALLATION

- A. Water-Main Connection: Tap water main with size and in location as indicated according to requirements of water utility.
- B. Make connections larger than 2-inch NPS (DN50) with tapping machine according to the following:
  - 1. Install tapping sleeve and tapping valve according to manufacturer's written instructions.
  - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
  - 3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
  - 4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
- C. Comply with NFPA 24 for fire-protection water-service piping materials and installation.
- D. Install ductile-iron piping according to AWWA C600.
  - 1. Encase piping with PE film according to ASTM A 674 or AWWA C105.
- E. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- F. Install AWWA PVC plastic pipe according to AWWA M23 and ASTM F 645.
- G. Install PE plastic pipe according to ASTM D 2774, ASTM F 645, and manufacturer's written instructions.
- H. Install PEX plastic tubing according to ASTM D 2774, ASTM F 645, and manufacturer's written instructions.
- I. Bury piping with depth of cover over top at least 42 inches (750 mm), with top at least 12 inches (300 mm) below level of maximum frost penetration, and according to the following:
  - 1. Under Driveways: With at least 42 inches (900 mm) cover over top.
  - 2. Under Railroad Tracks: With at least 48 inches (1200 mm) cover over top.
- J. Install piping under streets and other obstructions that cannot be disturbed, by tunneling, jacking, or combination of both.

### 3.8 ANCHORAGE INSTALLATION

- A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
  - 1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.
  - 2. Gasketed-Joint, PVC Potable-Water Piping: According to AWWA M23.
  - 3. Fire-Service Piping: According to NFPA 24.

- B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

### 3.9 VALVE INSTALLATION

- A. General Application: Use mechanical-joint-end valves for 3-inch NPS (DN80) and larger underground installation. Use threaded- and flanged-end valves for installation in pits. Use nonrising-stem UL/FM gate valves for installation with indicator posts. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch NPS (DN50) and smaller installation.
- B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.
- C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.
- D. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's written instructions. Install underground curb stops with head pointed up and with cast-iron curb box.

### 3.10 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints and anchoring tee, thrust blocks, and support in upright position. Wrap hydrant barrel, valve, and supply line to ground level in P.E. encasement. Back fill with granular material and compact to support hydrant.
- B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.
- C. AWWA-Type Fire Hydrants: Comply with AWWA M17.
- D. UL/FM-Type Fire Hydrants: Comply with NFPA 24.

### 3.11 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water-service piping. Locate 16 inches to 24 inches below finished grade, directly over piping.
- B. Attach nonmetallic piping label permanently to main electrical meter panel.

### 3.12 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure, or 150 psi, whichever is greater, for 2 hours. Furnish all necessary equipment and materials to conduct the test. All taps shall be made prior to conducting the test.

1. Comply with AWWA C-600 for Testing requirements.

C. Prepare reports for testing activities.

### 3.13 CLEANING

A. Clean and disinfect water distribution piping and tanks according to AWWA C651, and as follows:

1. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:

- a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine. Isolate system or part thereof and allow to stand for 24 hours.
- b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
- c. Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
- d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports for purging and disinfecting activities.

**END OF SECTION 33 10 00**



## SECTION 33 30 00 - SANITARY SEWERAGE UTILITIES

### 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. Materials and installation shall comply with the local sewer utilities requirements, standard drawings, and specifications.

#### 1.2 SUMMARY

- A. This Section includes sanitary sewerage outside the building.
- B. Related Sections include the following:
  - 1. Division 3 Section "Cast-in-Place Concrete" for concrete structures.

#### 1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Non-pressure-Piping Pressure Ratings: At least equal to system test pressure.
- B. Force-Main Pressure Ratings: At least equal to system operating pressure, but not less than 150 psig

#### 1.5 QUALITY ASSURANCE

- A. Environmental Agency Compliance: Comply with regulations pertaining to sanitary sewer systems.
- B. Utility Compliance: Comply with regulations pertaining to sanitary sewer systems.

#### 1.6 SUBMITTALS

- A. Product Data: For the following:
  - 1. Stainless-steel drainage systems.
  - 2. Backwater valves and cleanouts.



3. Manhole cover inserts.
- B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
  1. Precast concrete manholes, including frames and covers.
  2. Pipe materials including wyes and fittings.
- C. Coordination Drawings: Show manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.
- D. Coordination Profile Drawings: If profiles are not shown on the construction documents, show system piping in elevation; horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- E. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
- F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight, and protect pipe, fittings, and seals from dirt and damage.
- B. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

#### 1.8 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  1. Notify Architect not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Architect's written permission.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Gray-Iron Backwater Valves and Cleanouts:
    - a. Josam Co.
    - b. McWane, Inc.; Tyler Pipe; Wade Div.
    - c. Smith: Jay R. Smith Mfg. Co.
    - d. Watts Industries, Inc.; Ancon Drain Div.
    - e. Watts Industries, Inc.; Enpoco, Inc. Div.
    - f. Zurn Industries, Inc.; Hydromechanics Div.
  2. PVC Backwater Valves and Cleanouts:
    - a. Canplas, Inc.
    - b. IPS Corp.
    - c. NDS, Inc.
    - d. Plastic Oddities, Inc.
    - e. Sioux Chief Manufacturing Co., Inc.
  3. Manhole Cover Inserts:
    - a. FRW Industries, Inc.
    - b. Knutson Manufacturing Co.
    - c. Parson Environmental Products, Inc.
    - d. LFM Manufacturing Inc.
  4. Casing Pipe Spacers and End Boots
    - a. Advanced Products & Systems
    - b. Pipeline Seal and Insulator, Inc.
    - c. Cascade Waterworks Manufacturing
- 2.2 PIPING MATERIALS
- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS If a specific type of pipe is specified on the drawings, the specified type must be used. If a type of pipe is not specified on the drawings, one of the following shall be provided:

A. PVC Sewer Pipe and Fittings:

1. PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35, gasketed joints, ASTM D 3212, with cell classification of ASTM B or C 12454.
  - a. Gaskets: ASTM F 477, elastomeric seals.

B. Extra-Strength Vitrified Clay Sewer Pipe and Fittings: Extra-Strength Vitrified Clay Pipe and Fittings, ASTM C700, with joints conforming to ASTM C425. Gaskets shall be O-ring, compression type.

2.4 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.

1. Sleeve Material for Concrete Pipe: ASTM C 443 , rubber.
2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
5. Bands: Stainless steel, at least one at each pipe insert.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for non-pressure joints.

1. Material for Concrete Pipe: ASTM C 443 (ASTM C 443M), rubber.
2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

C. Pressure-Type Pipe Couplings: AWWA C219, iron-body sleeve assembly matching OD of pipes to be joined, with AWWA C111 rubber gaskets, bolts, and nuts. Include PE film, pipe encasement.

D. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig (1725-kPa) minimum working pressure and for offset and expansion indicated. Include PE film, pipe encasement.

- E. Ductile-Iron Deflection Fittings: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 250-psig (1725-kPa) minimum working pressure and for up to 15 degrees deflection. Include PE film, pipe encasement.
- F. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig (1725-kPa) minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

## 2.5 PE FILM, PIPE ENCASEMENT

- A. ASTM A 674 or AWWA C105; PE film, tube, or sheet; 8-mil thickness (for Ductile Iron Pipe only)

## 2.6 MANHOLES

- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with rubber gasketed joints.
  - 1. Inside Diameter: 48 inches minimum, unless otherwise indicated.
  - 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as indicated or as necessary to prevent flotation.
  - 3. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (100-mm) minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  - 4. Riser Sections: 4-inch (100-mm) minimum thickness, and lengths to provide depth indicated.
  - 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  - 6. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
  - 7. Grade Rings: Include no more than two reinforced-concrete rings, of 6 inch total thickness, that match 24-inch- diameter frame and cover.
  - 8. Steps: Aluminum, individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for manholes less than 60 inches deep.
  - 9. Steps: ASTM C 478 individual steps or ladder. Omit steps for manholes less than 60 inches deep.
  - 10. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

- B. Manhole Frames and Covers: For public manholes, conform to local sewer utility owner requirements for manhole, castings, and covers. Covers for private manholes shall include indented top design with lettering "SANITARY SEWER" cast into cover.
- C. Manhole Cover Inserts: Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent storm water inflow. Include handle for removal and gasket for gastight sealing.
  - 1. Type: Solid.
  - 2. Type: With drainage and vent holes.
  - 3. Type: With valve.

## 2.7 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
  - 1. Cement: ASTM C 150, Type II.
  - 2. Fine Aggregate: ASTM C 33, sand.
  - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
  - 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
  - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
  - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 , deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.
  - 1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
    - a. Invert Slope: 1 percent through manhole.
    - b. Invert Slope: 2 percent through manhole.
  - 2. Benches: Concrete, sloped to drain into channel.
    - a. Slope: 8 percent.
    - b. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

## 2.8 BACKWATER VALVES

A. Gray-Iron Backwater Valves: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.

1. Horizontal Type: With swing check valve and hub-and-spigot ends.
2. Combination Horizontal and Manual Gate-Valve Type: With swing check valve, integral gate valve, and hub-and-spigot ends.
3. Terminal Type: With bronze seat, swing check valve, and hub inlet.

B. PVC Backwater Valves: Similar to ASME A112.14.1, horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

## 2.9 CLEANOUTS

A. PVC Cleanouts: PVC body with PVC threaded plug with Cast Iron adapter. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

### 3.2 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

### 3.3 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. Sizes 4" through 24": Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.
2. Sizes 4" through 24": PVC sewer pipe and fittings, gasketed joints.

D. Force-Main Piping: Use the following:

1. Sizes 4" through 12": Ductile-iron sewer pipe; standard- or compact-pattern, ductile-iron fittings; gaskets; and gasketed joints.
2. Sizes 4" through 12": PVC pressure pipe, PVC pressure fittings, gaskets, and gasketed joints.

### 3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for non-pressure applications:
  - a. Sleeve type to join piping, of same size, or with small difference in OD.
  - b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
  - c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

### 3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
  2. Install piping with 36-inch minimum cover.
- F. Install force-main piping between and connect to building's sanitary-drainage force main and termination point indicated.
1. Install piping with restrained joints at horizontal and vertical changes in direction. Use cast-in-place concrete supports and anchors or corrosion-resistant rods and clamps.
  2. Install piping with 36-inch minimum cover.
- G. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
- H. Install ductile-iron, force-main piping according to AWWA C600.
- I. Install PVC force-main piping according to AWWA M23.
- J. Install force-main piping between and connect to building's force main and termination point indicated.
- K. Install force-main piping between and connect to packaged sewage pump station outlet and termination point indicated.
- L. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both. Casing pipe shall be steel pipe meeting ASTM specifications, 35,000 psi yield strength and 60,000 psi tensile strength to serve as a casing for the sewer and shall be installed within the limits and at the location shown on the construction drawings. The casing pipe shall be bituminous coated inside and out, and conform to ASTM A 123. The casing pipe shall have a minimum wall thickness as indicated in the table. Spacers and End Boots shall be as manufactured by Advanced Products & Systems. Joint restraints meeting the pipe manufacturers specifications shall be used on the carrier pipe.

### 3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.
- C. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.
1. Install PE film, pipe encasement over ductile-iron sewer pipe and ductile-iron fittings according to ASTM A 674 or AWWA C105.
- D. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.
- E. PVC Sewer Pipe and Fittings: As follows:



1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
  2. Install according to ASTM D 2321.
- F. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- G. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.
- H. Install with top surfaces of components, except piping, flush with finished surface.

### 3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Form continuous concrete channels and benches between inlets and outlet.
- C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.
- D. Install pre-cast concrete manhole sections with gaskets according to ASTM C 891.

### 3.8 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

### 3.9 BACKWATER VALVE INSTALLATION

- A. Install horizontal units in piping where indicated.
- B. Install combination units in piping and in structures where indicated.
- C. Install terminal units on end of piping and in structures where indicated. Secure units to structure walls.

### 3.10 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

### 3.11 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

- B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and use a sleeve type coupling with gasket joints to insure a water tight connection.
- C. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

### 3.12 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
  - 1. Close open ends of piping with at least 8-inch- (200-mm-) thick, brick masonry bulkheads.
  - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Structures: Excavate around structure in order to accomplish either procedure 1 or 2 and procedure 3 below:
  - 1. Remove structure and close open ends of remaining piping.
  - 2. Remove top of structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, gravel, or compacted dirt.
  - 3. Backfill to grade according to Division 2 Section "Earthwork."

### 3.13 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
  - 1. Place plug in end of incomplete piping at end of day and when work stops.
  - 2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again 30 days after completion of installation and placement of backfill.
  - 1. Submit separate reports for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 95 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.

- d. Infiltration: Water leakage into piping.
  - e. Exfiltration: Water leakage from or around piping.
  3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  4. Reinspect and repeat procedure until results are satisfactory.
- C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
  2. Test completed piping systems according to authorities having jurisdiction or those requirements shown on the drawings, whichever is more stringent.
  3. Schedule tests and inspections by authorities having jurisdiction with at least 48 hours' advance notice.
  4. Submit separate reports for each test.
  5. Perform tests meeting Ohio EPA, the Ten States Standards, and the requirements of local authorities, or the tests shown on the drawings, whichever is more stringent.
    - a. Sanitary Sewerage: Perform hydrostatic test.
    - b. Sanitary Sewerage: Perform air test according to UNI-B-6.
      - 1) Option: Test concrete piping according to ASTM C 924
    - c. Force Main: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than one times maximum system operating pressure, but not less than 150 psig (1035kPa)
      - 1) Ductile-Iron Piping: Test according to AWWA C600, Section "Hydraulic Testing."
      - 2) PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.
  6. Manholes: Perform vacuum test according to ASTM C 1244-93
  7. Leaks and loss in test pressure constitute defects that must be repaired.
  8. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

**END OF SECTION 33 30 00**

SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Site storm sewerage drainage piping, fittings and accessories, and bedding.
- B. Connection of drainage system to public utility.
- C. Catch basins, paved area drainage, site surface drainage, outfalls, and detention basin.
- D. Connection to drainage boots from building downspouts.

1.2 RELATED SECTIONS

- A. Section 31 20 00 – Earth Moving: Excavating for sewer system piping and structures.

1.3 REFERENCES

- A. ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
- B. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- C. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- D. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.
- E. AASHTO M 252
- F. ASTM F 477
- G. ASTM D3034 - Type PSM Polyvinylchloride (PVC) Sewer Pipe and Fittings.

1.4 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Product Data: Provide data indicating pipe, pipe accessories, and structures.

1.5 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- C. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

- A. Section 01 77 00 - Contract Closeout: Procedures for submittals.
- B. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, invert elevations, and other structures.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

## 1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable codes and local standards for materials and installation of the Work of this section.

## 1.8 COORDINATION

- A. Coordinate the Work with specified earthwork and connections to existing piping, inlets, downspouts and public utility.

## PART 2 - PRODUCTS

### 2.1 SEWER PIPE MATERIALS

If a specific type of pipe is specified on the drawings, the specified type must be used. If a type of pipe is not specified on the drawings, one of the following shall be provided:

#### A. Reinforced Concrete Sewer Pipe

##### 1. Reinforced Concrete Sewer Pipe

- a. Reinforced Concrete Pipe: ASTM C76, Class III with Wall Type B; mesh or bar reinforcement; inside nominal diameter indicated, bell and spigot end joints.
- b. Reinforced Concrete Pipe Joint Device: ASTM C443, rubber compression gasket joint.

##### 2. Plastic Pipe (PVC): Sizes 4" through 12" - ASTM D3034, Type PSM, Polyvinylchloride (PVC) material; inside nominal diameter indicated, bell and spigot style rubber ring sealed gasket joint.

##### 3. Corrugated Polyethelene (PE) Drainage Tubing: 4" through 60" - AASHTO M 252 Interim, Type S, with smooth waterway for gasketed joints.

- a. Pipe shall meet ASTM F2648 and shall have a smooth interior and annular exterior corrugations.
- b. 4 inch through 60-inch pipe shall meet ASTM F2648.
- c. Manning's "n" value for use in design shall be 0.012.
- d. Joint Performance Pipe shall be joined using a bell & spigot joint meeting ASTM F2648. The joint shall be soil-tight and gaskets, when applicable, shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer

and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

- e. Fittings shall conform to ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of ASTM F2306.

## 2.2 ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, adapters, reducers, traps and other configurations required.
  1. Grout: Specified in Section 705.22 of State of Ohio Department of Transportation Construction and Material Specifications.

## 2.3 CATCH BASINS

- A. Lid and Frame: Complying with State of Ohio Department of Transportation Construction and Material Specifications for lid and frame scheduled on Drawings.
- B. Shaft Construction and Top Section: Complying with State of Ohio Department of Transportation Construction and Material Specifications for shaft and top construction scheduled on Drawings.
  1. Base Pad: Complying with State of Ohio Department of Transportation Construction and Material Specifications for base pad construction scheduled on Drawings.

## 2.4 MANHOLES

- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with rubber gasketed joints.
  1. Inside Diameter: 48 inches minimum, unless otherwise indicated.
  2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as indicated or as necessary to prevent flotation.
  3. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 5-inch (100-mm) minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  4. Riser Sections: 5-inch (100-mm) minimum thickness, and lengths to provide depth indicated.
  5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  6. Gaskets: ASTM C 443 (ASTM C 443M), rubber.

7. Grade Rings: Include no more than two reinforced-concrete rings, of 6 inch total thickness, that match 24-inch-diameter frame and cover.
  8. Steps: Aluminum, individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch (300- to 400-mm) intervals. Omit steps for manholes less than 60 inches deep.
  9. Steps: ASTM C 478 individual steps or ladder. Omit steps for manholes less than 60 inches deep.
  10. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Manhole Frames and Covers: For public manholes, conform to local sewer utility owner requirements for manhole, castings, and covers. Covers for private manholes shall include indented top design with lettering "SANITARY SEWER" cast into cover.
- C. Manhole Cover Inserts: Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent storm water inflow. Include handle for removal and gasket for gastight sealing.
1. Type: Solid.
  2. Type: With drainage and vent holes.
  3. Type: With valve.

## 2.5 CLEANOUTS

- A. Cleanout Lid and Frame: Cast iron construction, hinged lid:
1. Lid Design: Checkerboard.
  2. Nominal Lid and Frame Size: 8 x 8 inch.
- B. Plastic Cleanout: ASTM D3034, Type PSM, Polyvinylchloride (PVC) material; inside nominal diameter indicated, bell and spigot style rubber ring sealed gasket joint for joining to conduits and threaded end for receiving threaded plastic cap.

## 2.6 BEDDING AND COVER MATERIALS

- A. Fine Bedding Material: As specified in Section 31 20 00 – Earth Moving.
- B. Coarse Bedding Material: As specified in Section 31 20 00 – Earth Moving.
- C. Compacted Granular Material:
1. Furnish material that meets the gradation of ODOT Item 304 (703.17), except 0 to 20 percent may pass the No. 200 sieve.
  2. Physical properties meeting ODOT Item 703.17.

## 2.7 OUTFALLS

- A. Riprap/Rock Channel Protection: As Specified on plans per ODOT Item 601.
- B. Energy Dissipaters: Construction as indicated, from materials indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that trench cut and excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

### 3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with Fill complying with requirements of Section 31 20 00 – Earth Moving.
- B. Remove large stones and other matter which could damage piping or impede consistent backfilling or compaction.

### 3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 31 20 00 – Earth Moving for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layer not less than:
  - 1. For sewer pipe 6-inches and less in diameter a depth of 6-inches below bottom of pipe compacted to 98-percent.
  - 2. For sewer pipe over 6-inches diameter a depth of 8-inches below bottom of pipe compacted to 98-percent.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.
  - 1. Extend bedding from bottom of pipe up to 1/3 pipe diameter. Shape bedding to receive pipe.

### 3.4 COVER

- A. Place cover material at top of bedding, level materials in continuous layer not less than:
- B. For sewer pipe 6-inches and less in diameter a depth of 6-inches above top of pipe compacted to 98-percent.
- C. For sewer pipe over 6-inches diameter a depth of 8-inches above top of pipe compacted to 98-percent.

### 3.5 INSTALLATION - PIPE



- A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal joints watertight.
- B. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1/8 inch in 10 feet.
- C. Install backfill at sides and over top of pipe.
- D. Refer to Section 31 20 00 – Earth Moving for trenching and backfilling requirements. Do not displace or damage pipe when compacting.
- E. Connect to building downspouts, inlets, existing piping and public utility.

### 3.6 INSTALLATION - CATCH BASINS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place Cast-In-Place Concrete base pad, with provision for storm sewer pipe end sections, or provide Fine Bedding Material to depth required for smooth level base to receive Pre-Cast Catch Basins.
- C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
- D. Establish elevations and pipe inverts for inlets and outlets as indicated.
- E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

### 3.7 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
- B. In large, accessible piping, brushes and brooms may be used for cleaning.
- C. Place plug in end of incomplete piping at end of day and when work stops.
- D. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- E. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
- F. Submit separate reports for each system inspection.
- G. Defects requiring correction include the following:
  - 1. Alignment: Less than full diameter of inside of pipe is visible between structures.
  - 2. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

3. Crushed, broken, cracked, or otherwise damaged piping.
  4. Infiltration: Water leakage into piping.
  5. Exfiltration: Water leakage from or around piping.
- H. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
- I. Re-inspect and repeat procedure until results are satisfactory.
- J. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
- K. Do not enclose, cover, or put into service before inspection and approval.
- L. Test completed piping systems according to authorities having jurisdiction.
- M. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
- N. Submit separate reports for each test.
- O. Where authorities having jurisdiction do not have published procedures, perform tests as follows:
1. Force Main: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than one and one-half times maximum system operating pressure, but not less than 150 psig.
  2. Ductile-Iron Piping: Test according to AWWA C600, Section "Hydraulic Testing."
  3. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.
- P. Leaks and loss in test pressure constitute defects that must be repaired.
- Q. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### 3.8 PROTECTION

- A. Protect finished Work under provisions of contract documents.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

### 3.9 SCHEDULE

- A. Storm Sewer Piping
  1. Reinforced Concrete Pipe, Non-reinforced Concrete Pipe, and Plastic pipe where indicated.

2. Size indicated.
  3. Bedding
    - a. Under Paved Areas - Coarse Aggregate Bedding compacted to 98 percent
    - b. Piping 6-inches and Less in Diameter Under Landscaped Areas - Fine Aggregate Bedding compacted to 98 percent.
    - c. Piping Over 6-inches in Diameter Under Landscaped Areas - Coarse Aggregate Bedding compacted to 98 percent
  4. Cover
    - a. Under Paved Areas – Compacted Granular Material
    - b. Piping 6-inches and Less in Diameter Under Landscaped Areas - Fine Aggregate Bedding compacted to 98 percent.
    - c. Piping Over 6-inches in Diameter Under Landscaped Areas - Coarse Aggregate Bedding compacted to 98 percent.
- B. Downspout Conduits
1. Plastic Pipe: 4-inch diameter unless otherwise indicated.
  2. Bedding
    - a. Under Paved Areas - Coarse Aggregate Bedding compacted to 98 percent
    - b. Piping 6-inches and Less in Diameter Under Landscaped Areas - Fine Aggregate Bedding compacted to 98 percent.
    - c. Piping Over 6-inches in Diameter Under Landscaped Areas - Coarse Aggregate Bedding compacted to 98 percent
  3. Cover
    - a. Under Paved Areas - Compacted Granular Material
    - b. Piping 6-inches and Less in Diameter Under Landscaped Areas - Fine Aggregate Bedding compacted to 98 percent.
    - c. Piping Over 6-inches in Diameter Under Landscaped Areas - Coarse Aggregate Bedding compacted to 98 percent.
- C. Finger Drains
1. Perforated Corrugated, Polyethelene (PE) Drainage Tubing
  2. 6-inch diameter unless otherwise indicated.

3. Bedding: Filtering Material.
  4. Cover: Filtering Material
- D. Underdrains
1. Perforated Corrugated, Polyethelene (PE) Drainage Tubing
  2. 6-inch diameter unless otherwise indicated.
  3. Bedding: Filtering Material.
  4. Cover: Filtering Material

**END OF SECTION 33 41 00**



## SECTION 334600 – FOUNDATION DRAINAGE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Provide foundation wall system as shown and specified. Work includes:
  - 1. Providing piping, fittings, filter fabric, accessories and drainage fill.
  - 2. Excavating and backfilling installed foundation drainage systems.
- B. Related Sections:
  - 1. Division 33 Section “Storm Utility Drainage Piping” for discharge connections to perimeter drainage system.

#### 1.2 REFERENCES

- A. Reference standards:
  - 1. ASTM:
    - a. ASTM A74-03b "Cast Iron Soil Pipe and Fittings."
    - b. ASTM F405-97 "Corrugated Polyethylene (PE) Tubing and Fittings."

#### 1.3 SUBMITTALS

- A. Submit manufacturer's product data for the type of drainage material required. Show types and sizes of pipe, fittings and accessories proposed for the work.
- B. Submit Contractor's certification that installed materials comply with specification requirements and that foundation drainage systems were successfully inspected and tested before covering with drainage fill and backfill materials.

#### 1.4 QUALITY ASSURANCE

- A. Excavating, backfilling and compacting: Comply with Division 31 “Earthwork” requirements.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Drainage piping: ASTM F405 perforated, corrugated polyethylene drainage tubing by Advanced Drainage Systems, Hancor, or Timewell Drainage Products.
  - 1. Provide drainage piping complete with factory fabricated and matching reducers, adaptors, fittings and accessory components to ensure continuity of the drainage system.
  - 2. Provide piping with Drain Guard protective wrapping.
  - 3. Minimum 4" inside diameter. Provide unperforated runout pipe.

- B. Drainage fill: ODOT 703 #6 (3/8" to 3/4") clean, uniformly graded stone or gravel.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine the areas and conditions under which foundation drainage work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

#### 3.2 INSTALLATION

- A. Perform excavating and backfilling to install foundation drainage.
- B. Provide a compacted earth base adjacent to the foundation wall footings. Hand trim excavations to required elevation. Place and compact earth fill to raise low areas and provide a positive flow. Lay drain lines nominal 6" from footing.
- C. Install not less than 4" layer of drainage fill over compacted earth base for bedding drainage pipe.
- D. Lay drain pipe with perforations down, joints closed and solidly bedded in drainage fill material. Provide full bearing for each pipe section. Provide continuous slope in the direction of flow.
  - 1. Provide collars and couplings for all in-line joints and ell, elbow or bend sections for all corners and changes in direction.
  - 2. Extend drainage system to interior sump and make connections. Provide cast iron pipe section through foundation wall.
- E. Obtain required inspections and perform testing before backfilling. Test installed system with water. Remove obstructions, replace damaged components and retest system to ensure proper operation. Provide a satisfactory free flowing foundation drainage system.
- F. Place drainage fill over drain lines after satisfactory testing and acceptance. Place and compact drainage fill material with vibrating compactors in layers not exceeding 6" in loose depth. Exercise care to prevent damage or displacement of drainage piping.
  - 1. Completely cover drain lines to a width of at least 6" on each side of pipe and up to base elevation of concrete floor slab aggregate base.

END OF SECTION 334600