

## **PROJECT MANUAL**

### **PROJECT:**

BATTLE CREEK PUBLIC SCHOOLS – ROOFING PROJECTS

URBANDALE ELEMENTARY SCHOOL  
10 N. Division Street, Battle Creek, 49014

FREMONT ELEMENTARY SCHOOL  
115 Emmett Street, Battle Creek, MI 49014

ANN J. KELLOGG ELEMENTARY SCHOOL  
306 Champion Street, Battle Creek, MI 49037.

W.K. KELLOGG PREPARATORY HIGH SCHOOL  
60 W. Van Buren Street, Battle Creek, MI 49017

### **OWNER:**

BATTLE CREEK PUBLIC SCHOOLS  
3 West Van Buren Street  
Battle Creek Michigan 49017

**TMP PROJECT NO.:** 25041

**DATE:** January 12, 2026

**ISSUED FOR CONSTRUCTION DOCUMENTS**

### **ARCHITECT**

TMP ARCHITECTURE, INC.  
259 East Michigan Avenue, Suite 308  
Kalamazoo, Michigan 49007

PH 269-327-0077  
Email [info@tmp-architecture.com](mailto:info@tmp-architecture.com)

### **CONSTRUCTION MANAGER**

ELITE COMPANIES  
221 E Water Street  
Kalamazoo, MI 49007

PH (269) 910 1347  
Email [elite-companies.com](mailto:elite-companies.com)

**ELECTRICAL CONSULTANT**

IGNYTE DESIGN  
38 Commerce Avenue SW Suite 400  
Grand Rapids MI, 49503

PH (616) 550 5411  
Email: [www.ignite.design](http://www.ignite.design)

## TABLE OF CONTENTS

### **DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS**

00 0101	PROJECT MANUAL
00 0110	TABLE OF CONTENTS
00 0115	LIST OF DRAWINGS
00 8200	AVAILABILITY OF ELECTRONIC FILES
00 8200.01	TMP ELECTRONIC FILE RELEASE FORM

### **DIVISION 01 - GENERAL REQUIREMENTS**

01 2300	ALTERNATES
01 2500	SUBSTITUTION PROCEDURES
01 2500.01	TMP SUBSTITUTION REQUEST FORM
01 3000	ADMINISTRATIVE REQUIREMENTS
01 3000.02	TMP SUBMITTAL AND SAMPLE TRANSMITTAL FORM
01 4000	QUALITY REQUIREMENTS
01 4100	REGULATORY REQUIREMENTS
01 4216	DEFINITIONS
01 4219	REFERENCE STANDARDS
01 4533	CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES
01 6000	PRODUCT REQUIREMENTS
01 7000	EXECUTION AND CLOSEOUT REQUIREMENTS
01 7327	CUTTING AND PATCHING OF SINGLE PLY ROOFING
01 7800	CLOSEOUT SUBMITTALS

### **DIVISION 02 - EXISTING CONDITIONS**

02 4100	DEMOLITION
---------	------------

### **DIVISION 03 - CONCRETE**

03 3000	CAST-IN-PLACE CONCRETE
---------	------------------------

### **DIVISION 04 - MASONRY**

04 0100	MAINTENANCE OF MASONRY
04 4316	STONE FABRICATIONS

### **DIVISION 05 - METALS**

05 5000	METAL FABRICATIONS
---------	--------------------

### **DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES**

06 1000	ROUGH CARPENTRY
---------	-----------------

### **DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

07 0150.19	PREPARATION FOR RE-ROOFING
07 3113	ASPHALT SHINGLES
07 5400	THERMOPLASTIC MEMBRANE ROOFING
07 5423	TPO MEMBRANE ROOFING

07 5600	FLUID-APPLIED ROOFING
07 7100	ROOF SPECIALTIES
07 7200	ROOF ACCESSORIES
07 9200	JOINT SEALANTS

**DIVISION 26 - ELECTRICAL**

26 0010	SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL
26 0519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 0533.13	CONDUITS FOR ELECTRICAL SYSTEMS
26 0533.16	BOXES AND COVERS FOR ELECTRICAL SYSTEMS
26 0544	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

**SECTION 00 0115 - LIST OF DRAWINGS**

**LIST OF DRAWINGS**

**1.01 GENERAL**

- A. Drawings: Drawings consist of the Contract Drawings including drawings listed on the TITLE SHEET page of the separately bound drawing set titled Battle Creek Public Schools - Roofing Projects: Urbandale Elementary School, Fremont Elementary School, Ann J. Kellogg Elementary School and W.K. Kellogg Preparatory High School, dated 01-12-2026 and any subsequent Addenda and Contract modifications which may occur.

**END OF SECTION 00 0115**

**SECTION 00 8200.01 - TMP ELECTRONIC FILE RELEASE FORM**

**RE: AUTHORIZATION FORM FOR CAD FILE TRANSFERS**

**PROJECT NAME:** \_\_\_\_\_

**TMP PROJECT NO. :** \_\_\_\_\_ **BID PACK NO.** \_\_\_\_\_

**DEAR SIR/MADAM:**

- A. Per your request, TMP Architecture, Inc. will electronically transmit requested CAD files upon receipt of an original signed copy of this form which states the conditions of agreement and the receipt of the required compensation fee.
- B. By acceptance it is understood and agreed that the data and medium being supplied is to be used only for the project referenced.
- C. It is further understood and agreed that the undersigned will hold TMP Architecture, Inc. and its Consultants harmless and indemnify TMP Architecture, Inc. and its Consultants from all claims, liabilities, losses, and so forth, including attorney's fees arising out of the use or misuse of the transferred files.
- D. It is understood and agreed that the items transmitted are prepared from CAD files current at the time of preparation. All files are [AutoCAD version 2018 dwg files].
- E. This information does not waive the need to verify and review current field conditions and the status of Addenda and/or Bulletin documentation.
- F. As a record of information to be transmitted, TMP Architecture, Inc. will prepare a duplicate electronic back-up for its record.
- G. Compensation for providing this material will be as follows:
  - 1. Base Fee of [\$250] for 1 to 3 Drawings.
  - 2. Base Fee of [\$500] for 4 to 10 Drawings.
- H. For each additional Drawing after 10 the fee is [\$40] per Drawing.
- I. Example: [11 drawings = \$540].
- J. Payment must be provided along with a signed copy of this form before files will be released. Please remit to [Construction Manager] to be forwarded to the Project Manager at TMP Architecture, Inc. and allow five working days for processing.

**FEE: \$** \_\_\_\_\_

**REQUESTED DRAWINGS:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**FIRM REQUESTING FILES:**

Company: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Signed: \_\_\_\_\_ Date: \_\_\_\_\_  
 Printed Name / Title: \_\_\_\_\_  
 Email: \_\_\_\_\_

**TO BE COMPLETED BY TMP ARCHITECTURE, INC.**

Released(signed by): \_\_\_\_\_ TMP Architecture, Inc.

Printed Name/Title: \_\_\_\_\_ Date: \_\_\_\_\_  
**END OF SECTION 00 8200.01**

**SECTION 00 8200 - AVAILABILITY OF ELECTRONIC FILES****AVAILABILITY OF ELECTRONIC FILES****1.01 POLICY**

- A. As a service to Contractor, subcontractors, vendors, material suppliers and others needing electronic copies of Drawings, the Architect will provide CAD files electronically in accordance with the following policy:
1. By acceptance it is understood and agreed that the data and medium being supplied is to be used only for the project referenced.
  2. It is further understood and agreed that the undersigned will hold TMP Architecture, Inc. and its Consultants harmless and indemnify TMP Architecture, Inc. and its Consultants from all claims, liabilities, losses, and so forth, including attorney's fees arising out of the use or misuse of the transferred files.
  3. It is understood and agreed that the files transmitted are prepared from CAD files current at the time of preparation. All files are AutoCAD version 2018 dwg files.
  4. This information does not waive the need to verify and review current field conditions and the status of Addenda and/or Bulletin documentation.
  5. As a record of information to be transmitted, TMP Architecture, Inc. will prepare a duplicate electronic back-up for its record.
  6. Compensation Fee for providing this material will be as follows:
    - a. Base Fee of \$250 for 1 to 3 Drawings.
    - b. Base Fee of \$500 for 4 to 10 Drawings.
    - c. For each additional Drawing after 10, the fee is \$40 per Drawing.
      - 1) Example: 11 Drawings = \$540.
  7. A signed copy of the Release Form and Fee must be provided before files will be released.

**1.02 REQUEST PROCEDURE**

- A. To receive Drawing CAD files the Release Form must be completed in full and submitted to the Construction Manager to be forwarded to the Project Manager at TMP Architecture, Inc.
1. A signed copy of the Release Form must be submitted.
    - a. Faxed or emailed copies will be accepted.
  2. Upon remittance of the signed Release Form and Fee, allow five working days for processing.
  3. Transmission of Drawings will be provided electronically after the receipt of Fee.

**1.03 RELEASE FORM**

- A. Release Form is located immediately after this Section. Refer to Section 00 8200.01 Electronic Files Release Form.

**END OF SECTION 00 8200**

**SECTION 01 2300 - ALTERNATES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Description of Alternates.

**1.02 ACCEPTANCE OF ALTERNATES**

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

**1.03 SCHEDULE OF ALTERNATES**

- A. Alternate 1 - Roofing
  - 1. Base Bid: To provide and install TPO Roof Membrane assembly as detailed including insulation, flashings to roof areas as indicated on the Drawings.
    - a. Refer to Section No. 07 5423 - TPO Membrane Roofing
  - 2. Alternate: To provide and install KEE Roofing Membrane in lieu of TPO Roofing.
    - a. Refer to Section No. 07 5400 - Thermoplastic Membrane Roofing.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION 01 2300**

SECTION 01 2500.01 - TMP SUBSTITUTION REQUEST FORM

SUBSTITUTION REQUEST NUMBER: \_\_\_\_\_ DATE SUBMITTED: \_\_\_\_\_

TMP PROJECT NUMBER: 25041 PROJECT NAME: BATTLE CREEK PUBLIC SCHOOLS - ROOFING PROJECTS

SPECIFIED ITEM

SPECIFICATION TITLE: \_\_\_\_\_

SPECIFICATION SECTION \_\_\_\_\_ SPECIFICATION ARTICLE/PARAGRAPH: \_\_\_\_\_

SPECIFIED PRODUCT / DESCRIPTION: \_\_\_\_\_

SPECIFIED MANUFACTURER: \_\_\_\_\_

SPECIFIED PRODUCT / MODEL: \_\_\_\_\_

REASON SPECIFIED ITEM CANNOT BE PROVIDED: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

PROPOSED SUBSTITUTION

DESCRIPTION OF PROPOSED SUBSTITUTION: \_\_\_\_\_

PROPOSED MANUFACTURER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

WEBSITE: \_\_\_\_\_

PRODUCT / MODEL: \_\_\_\_\_

YEARS PRODUCT/MODEL HAS BEEN MANUFACTURED: \_\_\_\_\_

DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED ITEM: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

WILL PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?  NO  YES

IF YES, EXPLAIN HOW: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

HOW WILL SUBSTITUTION BENEFIT THE OWNER:  COST SAVINGS  TIME SAVINGS  OTHER

PROVIDE SPECIFIC DETAILS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

THE FOLLOWING INFORMATION IS REQUIRED; CHECK TO INDICATE INFORMATION IS ATTACHED. (REQUEST WILL BE REJECTED WITHOUT REQUIRED DATA)

32.01

- A.  List of references where proposed product has been installed; include address, owner, architect, and date installed.
- B.  Product data sheets.

- C.  Applicable certificates and test reports.
- D.  Comparative Data: Provide point-by-point, side-by-side comparison of specified product and proposed substitution addressing essential attributes specified.

**INDICATE WHICH OF THE FOLLOWING VOLUNTARY INFORMATION IS ATTACHED, IF ANY:**

- DRAWINGS.**
- SAMPLES.**
- OTHER ITEMS:** \_\_\_\_\_

**SIGNATURE**

**THE UNDERSIGNED CERTIFIES:**

The proposed substitution meets or exceeds the quality level of the specified product, equipment, assembly, or system.  
 To provide the same warranty for the substitution as for the specified product.  
 Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.  
 Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.  
 The proposed substitution will have no adverse effects on other work.  
 The proposed substitution will not affect project schedule.  
 Waives claims for additional costs or time extension that may subsequently become apparent.

**CONTRACTOR / COMPANY:** \_\_\_\_\_  
**SIGNED BY:** \_\_\_\_\_ **PRINTED NAME:** \_\_\_\_\_  
**TITLE:** \_\_\_\_\_  
**ADDRESS:** \_\_\_\_\_  
**EMAIL:** \_\_\_\_\_ **PHONE:** \_\_\_\_\_

**ARCHITECT'S RESPONSE**

- A. During bidding, Architect will approve substitution requests by issuing an Addendum. Substitutions not approved by addendum are rejected.
- B. During construction, Architect will notify Contractor in writing (see below) of decision to accept or reject request, and incorporate the substitution into the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments as provided for in the Conditions of the Contract.

SUBSTITUTION APPROVED - PROVIDE SUBMITTALS PER SECTION 01 3000 AND RESPECTIVE  
**SECTION FOR WHICH SUBSTITUTION WAS MADE.**

**SUBSTITUTION REJECTED - PROVIDE SPECIFIED MATERIALS.**

**SIGNED BY:** \_\_\_\_\_ **PRINTED NAME:** \_\_\_\_\_

**ARCHITECT'S COMMENTS:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**END OF SECTION 01 2500.01**

**SECTION 01 2500 - SUBSTITUTION PROCEDURES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Procedural requirements for proposed substitutions.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 2500.01 - TMP Substitution Request Form.

**1.03 DEFINITIONS**

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
  - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
  - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
- B. Substitutions: Any proposed substitution to be evaluated by the Architect and accepted as stipulated below.

**PART 2 PRODUCTS - NOT USED****PART 3 EXECUTION****3.01 GENERAL REQUIREMENTS**

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
  - 2. Agrees to provide the same warranty for the substitution as for the specified product.
  - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
  - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
  - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
  - 1. Note explicitly any non-compliant characteristics.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
  - 1. Forms included in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.
  - 1. Submit an electronic document, combining the request form with supporting data into single document.

**3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT**

- A. Submittal Time Restrictions:
- B. Substitution Request Form: TMP Substitution Request Form must be completed and provided at the beginning of each substitution request.
  - 1. Refer to Section 01 2500.01 - TMP Substitution Request Form.
  - 2. Submittals without a completed TMP Substitution Request Form will not be acknowledged, reviewed, or returned. Use only this form; other forms of submission are unacceptable.
- C. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period.

**3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION**

- A. Substitution Request Form: TMP Substitution Request Form must be completed and provided at the beginning of each substitution request.
  - 1. Refer to Section 01 2500.01 - TMP Substitution Request Form.
  - 2. Submittals without a completed TMP Substitution Request Form will not be acknowledged, reviewed, or returned. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause immediately upon discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
  - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
  - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
  - 3. Bear the costs engendered by proposed substitution of:
    - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
    - b. Other unanticipated project considerations.
- D. Substitutions will not be considered under one or more of the following circumstances:
  - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
  - 2. Without a separate written request.

**3.04 RESOLUTION**

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
  - 1. During construction, Architect's decision following review of proposed substitution will be noted on the submitted form.
  - 2. During bidding, Architect will approve substitution requests by issuing an Addendum. Substitutions not approved by addendum are rejected.

**3.05 ACCEPTANCE**

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

**3.06 CLOSEOUT ACTIVITIES**

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

**END OF SECTION 01 2500**



# SUBMITTAL AND SAMPLE TRANSMITTAL FORM

01 1300.02

CONST. MANAGER / CONTRACTOR		PROJECT	TMP PROJECT NO.	DATE SUBMITTED	SUBMITTAL NO.						
Name and Address:		Title:									
			* ACTION CODES		Initial Submittal	<input type="checkbox"/>					
			R	Reviewed – No Exceptions Taken	Resubmittal	<input type="checkbox"/>					
			RN	Reviewed with Corrections Noted							
Email:		Location:	RR	Revise and Resubmit	REVIEWED BY						
			X	Not Approved – Resubmit	TMP	<input type="checkbox"/>					
Phone:			NA	No Action Taken – Not Reviewed	Consultant	<input type="checkbox"/>					
					Reviewer:						
SPECIFICATION SECTION NO.	SUBCONTRACTOR / MANUFACTURER	ITEM DESCRIPTION	NO. OF SAMPLES	NO. OF SAMPLES RETURNED	ACTION CODE *	DATE REVIEWED	DATE RETURNED				
Transmittal shall be for one specification section only; do not submit items from multiple sections under the same transmittal. Multi-section submittals will be returned; stamped "X - Not Approved - Resubmit"											
Submittal Stamps may be placed on subsequent blank page.											
CONTRACTOR COMMENTS		ARCHITECT COMMENTS		The undersigned certifies that the above submitted items have been reviewed in detail and are correct and in strict conformance with the Contract Documents except as otherwise noted. NOTE: Approval of items submitted does not relieve Contractor from complying with all requirements of the Contract Documents.							
								CONTRACTOR NAME			
								SIGNATURE			

*This page intentionally left blank for Submittal Stamps*

**SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Submittals for review, information, and project closeout.
- B. Number of copies of submittals.
- C. Requests for Interpretation (RFI) procedures.
- D. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 3000.01 - TMP Submittal and Sample Transmittal Form.

**1.03 REFERENCE STANDARDS**

- A. AIA G716 - Request for Information; 2004.
- B. CSI/CSC Form 13.2A - Request for Information; Current Edition.

**PART 2 PRODUCTS - NOT USED****PART 3 EXECUTION****3.01 REQUESTS FOR INTERPRETATION (RFI)**

- A. Definition: A request seeking one of the following:
  - 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
  - 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
  - 1. Prepare a separate RFI for each specific item.
    - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
    - b. Do not forward requests which solely require internal coordination between subcontractors.
  - 2. Prepare in a format and with content acceptable to Architect. Use one of the following:
    - a. Use AIA G716 - Request for Information .
    - b. Use CSI/CSC Form 13.2A - Request for Interpretation.
    - c. Other format acceptable to Architect.
  - 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
  - 4. Submit RFIs through Procure, email, or other approved method agreed to by the Architect and Owner.
    - a. RFIs submitted via an internet-based submittal service are to send electronic documents to the Architect via email with a downloadable link.
- C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
  - 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
  - 2. Improper RFIs: Requests not prepared in conformance to requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response and may include an explanatory notation.
  - 3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response and may include an explanatory notation.

- a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
  2. Discrete and consecutive RFI number, and descriptive subject/title.
  3. Issue date, and requested reply date.
  4. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
  5. Annotations: Field dimensions and/or description of conditions which have engendered the request.
  6. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
  2. Note dates of when each request is made, and when a response is received.
  3. Identify and include improper or frivolous RFIs.
- G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 3:00 PM will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
  2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
  3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
  4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

### **3.02 SUBMITTAL SCHEDULE**

- A. Submit to Architect for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule.
  2. Coordinate with Contractor's construction schedule and schedule of values.
  3. Format schedule to allow tracking of status of submittals throughout duration of construction.

4. Arrange information to include scheduled date for initial submittal, specification number and title, description of item of work covered, and role and name of subcontractor.
5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
  - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

### **3.03 SUBMITTALS FOR REVIEW**

- A. When the following are specified in individual sections, submit them for review:
  1. Product data.
  2. Shop drawings.
  3. Samples for selection.
  4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

### **3.04 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in individual sections, submit them for information:
  1. Design data.
  2. Certificates.
  3. Test reports.
  4. Inspection reports.
  5. Manufacturer's instructions.
  6. Manufacturer's field reports.
  7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

### **3.05 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
  1. Project record documents.
  2. Operation and maintenance data.
  3. Warranties.
  4. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

### **3.06 NUMBER OF COPIES OF SUBMITTALS**

- A. Electronic Documents: Submit one electronic copy.
- B. Samples: Submit the number specified in individual specification sections, but not less than 3; one (minimum) of which will be retained by Architect.
  1. After review, produce duplicates.
  2. Retained samples will not be returned to Contractor unless specifically so stated.

### **3.07 SUBMITTAL PROCEDURES**

- A. Transmittal Form: TMP Submittal and Sample Transmittal Form must be completed and provided at the beginning of each submittal.
  1. Refer to Section 01 3000.01 - TMP Submittal and Sample Transmittal Form.

2. Submittals without a completed TMP Submittal and Sample Transmittal Form will not be acknowledged, reviewed, or returned.
- B. Submittals shall be submitted in electronic form.
  1. Exceptions: Physical samples.
    - a. Physical Samples must be accompanied by an electronic copy and a hard/physical copy of the completed TMP Submittal and Sample Transmittal Form.
- C. Electronic Submittals: Comply with the following:
  1. Submittal process shall be through Procure, email, or other approved method agreed to by the Architect and Owner.
    - a. Submittals via an internet-based submittal service are to send electronic documents to the Architect via email with a downloadable link.
  2. File Format: Portable Document Format (PDF).
  3. File Naming: File naming shall be in the following format:
    - a. Specification section number, followed by a hyphen, and a consecutive number indicating sequential submittals for that section; followed by a general description of the submittal contents.
      - 1) Examples:
        - (a) Section 07 9200; first submittal:
          - (1) 07 9200-01 Joint Sealants
        - (b) Section 07 9200; second submittal:
          - (1) 07 9200-02 Joint Sealant Color
      - b. Resubmittals. For revised resubmittals use original number and a sequential combination numerical and alphabetical suffix; hyphen followed by "R" and a two-digit consecutive number indicating sequential resubmittals for that particular submittal.
        - 1) Examples:
          - (a) Section 07 9200; resubmittal of first submittal of section:
            - (1) 07 9200-01-R01 Joint Sealants.
          - (b) Section 07 9200; second resubmittal of first submittal of section:
            - (1) 07 9200-01-R02 Joint Sealants
          - (c) Section 07 9200; first resubmittal of second submittal of section:
            - (1) 07 9200-02-R01 Joint Sealant Color
    4. Each Submittal shall be one file, complete with all attachments.
      - a. Multi-file submittal will not be acknowledged, reviewed, or returned.
  - D. General Requirements:
    1. Use a single transmittal for related items.
      - a. Each transmittal shall be for one specification section only; do not submit items for multiple sections under the same transmittal.
        - 1) Multi-section submittals will be acknowledged and returned; stamped "X - Not Approved - Resubmit".
    2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
    3. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
    4. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    5. Schedule submittals to expedite the Project, and coordinate submission of related items.
      - a. For each submittal for review, allow 14 calendar days excluding delivery time to and from the Contractor.
      - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 calendardays.

6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
  7. When revised for resubmission, identify all changes made since previous submission.
  8. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
  9. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
  10. Submittals not requested will be recognized and returned; stamped "NA - No Action Taken - Not Reviewed"
- E. Product Data Procedures:
1. Submit only information required by individual specification sections.
  2. Collect required information into a single submittal.
  3. Submit concurrently with related shop drawing submittal.
  4. Do not submit (Material) Safety Data Sheets for materials or products unless specifically called for in individual sections.
- F. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
  2. Do not reproduce Contract Documents to create shop drawings.
  3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
  4. Non-complying submittals will be acknowledged and returned; stamped "X - Not Approved - Resubmit".
- G. Samples Procedures:
1. Transmit related items together as single package.
  2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
  3. Submit actual physical samples.
  4. Electronic submittals will not be accepted unless prior approval is received from the Architect. Electronic samples without prior approval will be acknowledged and returned; stamped "X - Not Approved - Resubmit."

### **3.08 SUBMITTAL REVIEW**

- A. General: Submittals that do not conform to the requirements of this section will not be acknowledged, reviewed, or returned.
- B. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- C. Submittals for Information: Architect will acknowledge and may review. See below for actions to be taken.
- D. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Where more than one action has been indicated, each shall apply to that portion of the submittal for which the action is indicated.
- E. Architect's review shall not indicate approval of dimensions, quantities or fabrication processes unless specific notations are made by the Architect regarding same.
- F. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
    - a. "Reviewed - No Exceptions Taken", "Approved", or language with same legal meaning.
    - b. "Reviewed with Corrections Noted", "Approved as Noted, Resubmission not required", or language with same legal meaning.
      - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.

2. Not Authorizing fabrication, delivery, and installation:
  - a. "Revise and Resubmit", "Not Approved - Resubmit", or language with the same legal meaning.
    - 1) Resubmit revised item, with review notations acknowledged and incorporated.
3. Not Authorizing manufacturer:
  - a. Rejected - Resubmit, or language with the same legal meaning.
- G. Architect's and consultants' actions on items submitted for information:
  1. Items for which no action was taken:
    - a. "No Action Taken - Not Reviewed" or "Received" - to notify the Contractor that the submittal has been received for record only.

**END OF SECTION 01 3000**

**SECTION 01 4000 - QUALITY REQUIREMENTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Contractor's design-related professional design services.
- F. Control of installation.
- G. Mock-ups.
- H. Tolerances.
- I. Manufacturers' field services.
- J. Defect Assessment.

**1.02 REFERENCE STANDARDS**

- A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025a.
- B. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.
- C. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

**1.03 DEFINITIONS**

- A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
  - 1. Design Services Types Required:
    - a. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
- B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

**1.04 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES**

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
  - 1. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
  - 2. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- C. Test Reports: After each test/inspection, promptly submit 1 copies of report to Architect and to Contractor.
  - 1. Include:

- a. Date issued.
  - b. Project title and number.
  - c. Name of inspector.
  - d. Date and time of sampling or inspection.
  - e. Identification of product and specifications section.
  - f. Location in the Project.
  - g. Type of test/inspection.
  - h. Date of test/inspection.
  - i. Results of test/inspection.
  - j. Compliance with Contract Documents.
  - k. When requested by Architect, provide interpretation of results.
2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

#### **1.06 QUALITY ASSURANCE**

- A. Testing Agency Qualifications:
1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time specialist and responsible officer.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

#### **1.07 REFERENCES AND STANDARDS**

- A. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- B. Obtain copies of standards where required by product specification sections.
- C. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

#### **1.08 TESTING AND INSPECTION AGENCIES AND SERVICES**

- A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:

1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, and ASTM E699.
2. Inspection agency: Comply with requirements of ASTM E329.
3. Laboratory Staff: Maintain a full time specialist on staff to review services.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

### **3.02 MOCK-UPS**

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
- D. Notify Architect 5 working days in advance of dates and times when mock-ups will be constructed.
- E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- H. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
  1. Make corrections as necessary until Architect's approval is issued.
- I. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- J. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

### **3.03 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### **3.04 TESTING AND INSPECTION**

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
  - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 2. Perform specified sampling and testing of products in accordance with specified standards.
  - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
  - 5. Perform additional tests and inspections required by Architect.
  - 6. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
  - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency may not approve or accept any portion of the Work.
  - 3. Agency may not assume any duties of Contractor.
  - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
  - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  - 2. Cooperate with laboratory personnel, and provide access to the Work.
  - 3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
  - 4. Notify Architect and laboratory 48 hours prior to expected time for operations requiring testing/inspection services.
  - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

### **3.05 MANUFACTURERS' FIELD SERVICES**

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

### **3.06 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not complying with specified requirements.

- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

**END OF SECTION 01 4000**

**SECTION 01 4100 - REGULATORY REQUIREMENTS****PART 1 GENERAL****1.01 SUMMARY OF REFERENCE STANDARDS**

- A. Regulatory requirements applicable to this project are the following:
1. ASHRAE Std 90.1 I-P-2019 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2019, with Errata and Addenda (2021).
  2. Barrier Free Code: Comply with the following:
    - a. Michigan Building Code; 2021.
    - b. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
  3. School Fire Safety Rules: Michigan School Fire Safety Rules; 2016.
    - a. Includes NFPA 101-2012 - Life Safety Code; 2012, plus amendments.
  4. Building Code: Michigan Building Code; 2021.
  5. Plumbing Code: Michigan Plumbing Code; 2021.
  6. Mechanical Code: Michigan Mechanical Code; 2021.
  7. Electrical Code: NFPA 70 - National Electric Code; 2023.
    - a. Includes 2023 Michigan Construction Code - Part 8 Electrical Code Rules.
  8. Elevator Code: Comply with the following:
    - a. ASME A17.1 - Safety Code for Elevators and Escalators; 2016.
    - b. ASME A18.1- Safety Standard for Platform Lifts and Stairway Chairlifts; 2017.
    - c. 2023 Michigan Elevator Safety Board General Rules.
  9. Boiler Code: Michigan Boiler Code.
    - a. Includes the following:
      - 1) ASME Boiler and Pressure Vessel Codes; 2019.
      - 2) National Board Inspection Code; 2019.
      - 3) PA 407 Skilled Trades Regulation Act; 2016.
  10. Energy Code: Michigan Commercial Energy Code; 2021.
    - a. Includes ASHRAE Std 90.1 I-P-2019 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2019.
  11. Existing Building Code: Michigan Rehabilitation Code; 2021.
- B. Where specification sections reference more current standards or codes, comply with the more restrictive requirements unless notified in writing by Architect.

**PART 2 PRODUCTS - NOT USED****PART 3 EXECUTION - NOT USED****END OF SECTION 01 4100**

**SECTION 01 4216 - DEFINITIONS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This section supplements the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

**1.02 DEFINITIONS**

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- E. Provide: To furnish and install.
- F. Supply: Same as Furnish.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION 01 4216**

**SECTION 01 4219 - REFERENCE STANDARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements relating to referenced standards.

**1.02 QUALITY ASSURANCE**

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with the reference standard of date of issue , except where a specific date is established by applicable code.
- C. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

**PART 2 PRODUCTS -- NOT USED**

**PART 3 EXECUTION -- NOT USED**

**END OF SECTION 01 4219**

**SECTION 01 4533 - CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Code-required special inspections.
- B. Submittals.

**1.02 ABBREVIATIONS AND ACRONYMS**

- A. AHJ: Authority having jurisdiction.
- B. NIST: National Institute of Standards and Technology.

**1.03 DEFINITIONS**

- A. Code or Building Code: Michigan Building Code; 2015, specifically Chapter 17 - Special Inspections and Tests.
- B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.
- C. Special Inspection:
  - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.
  - 2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

**1.04 REFERENCE STANDARDS**

- A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025a.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
  - 1. Submit agency name, address, and telephone number, names of full time specialist and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.
- C. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to the AHJ.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of Special Inspector.
    - d. Date and time of special inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of special inspection.
    - h. Date of special inspection.
    - i. Results of special inspection.
    - j. Compliance with Contract Documents.

2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.
- D. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to AHJ.
  1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of Special Inspector.
    - d. Date and time of special inspection.
    - e. Identification of fabricated item and specification section.
    - f. Location in the Project.
    - g. Results of special inspection.
    - h. Verification of fabrication and quality control procedures.
    - i. Compliance with Contract Documents.
    - j. Compliance with referenced standard(s).
- E. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one to AHJ.
  1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test or inspection.
    - h. Date of test or inspection.
    - i. Results of test or inspection.
    - j. Compliance with Contract Documents.

#### **1.06 SPECIAL INSPECTION AGENCY**

- A. Owner will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

#### **1.07 QUALITY ASSURANCE**

- A. Special Inspection Agency Qualifications:
  1. Independent firm specializing in performing testing and inspections of the type specified in this section.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL**

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
  1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
  2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

**3.02 SPECIAL INSPECTIONS**

- A. Special inspections and testing shall be for materials, installation, fabrication, erection or placement of components and connections as indicated on Drawings, but not less than that required by the building code.

**END OF SECTION 01 4533**

**SECTION 01 6000 - PRODUCT REQUIREMENTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Re-use of existing products.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

**1.02 SUBMITTALS**

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

**PART 2 PRODUCTS****2.01 EXISTING PRODUCTS**

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
  - 1. Refer to Drawings and Section 02 4100 - Demolition.

**2.02 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by Contract Documents.

**2.03 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- D. Available Products: Products specified by naming one or more Manufacturers as an Available Product indicates that these Manufacturers' products may be provided but other comparable products and Manufacturers not named may also be provided without submitting a request for substitution.

**2.04 MAINTENANCE MATERIALS**

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver and place in location as directed; obtain receipt prior to final payment.

**PART 3 EXECUTION****3.01 SUBSTITUTION LIMITATIONS**

- A. See Section 01 2500 - Substitution Procedures.

**3.02 OWNER-SUPPLIED PRODUCTS**

- A. Owner's Responsibilities:
  - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
  - 2. Arrange and pay for product delivery to site.
  - 3. On delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
  - 1. Review Owner reviewed shop drawings, product data, and samples.
  - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
  - 3. Handle, store, install and finish products.
  - 4. Repair or replace items damaged after receipt.

**3.03 TRANSPORTATION AND HANDLING**

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- F. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- G. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

**3.04 STORAGE AND PROTECTION**

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.

- I. Do not store products directly on the ground.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- L. Prevent contact with material that may cause corrosion, discoloration, or staining.
- M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

**END OF SECTION 01 6000**

**SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. General requirements for maintenance service.

**1.02 REFERENCE STANDARDS**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate Contractor.
  - 6. Include in request:
    - a. Identification of Project.
    - b. Location and description of affected work.
    - c. Necessity for cutting or alteration.
    - d. Description of proposed work and products to be used.
    - e. Effect on work of Owner or separate Contractor.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities.
- D. Warranties: For each affected material under warranty, submit written verification, signed by manufacturer of existing materials, stating that the Owner's full warranty will remain in effect after cutting and patching operations have been completed

**1.04 QUALIFICATIONS**

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

**1.05 PROJECT CONDITIONS**

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Perform dewatering activities, as required, for the duration of the project.

- E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
  - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
  - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
  - 1. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
  - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
  - 2. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.
- I. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

#### **1.06 COORDINATION**

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

#### **1.07 WARRANTIES**

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

### **PART 2 PRODUCTS**

#### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

#### **3.02 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

#### **3.03 PREINSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect 5 calendar days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with 1 copies to Architect, Owner, participants, and those affected by decisions made.

#### **3.04 LAYING OUT THE WORK**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- G. Utilize recognized engineering survey practices.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
  2. Grid or axis for structures.
  3. Building foundation, column locations, ground floor elevations.
  4. Controlling lines and levels required for mechanical and electrical trades.
- I. Periodically verify layouts by same means.
  - J. Maintain a complete and accurate log of control and survey work as it progresses.

### **3.05 GENERAL INSTALLATION REQUIREMENTS**

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

### **3.06 ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation only.
  1. Verify that construction and utility arrangements are as indicated.
  2. Report discrepancies to Architect before disturbing existing installation.
  3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
  1. Provide, erect, and maintain temporary dustproof partitions.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
  1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
  2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
  1. Remove items indicated on drawings.
  2. Relocate items indicated on drawings.
  3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
  1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
  3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.

- a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
- b. Provide temporary connections as required to maintain existing systems in service.
4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
  1. Prevent movement of structure; provide shoring and bracing if necessary.
  2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
  1. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
  1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
  2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

### **3.07 CUTTING AND PATCHING**

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
  1. Complete the work.
  2. Fit products together to integrate with other work.
  3. Provide openings for penetration of mechanical, electrical, and other services.
  4. Match work that has been cut to adjacent work.
  5. Repair areas adjacent to cuts to required condition.
  6. Repair new work damaged by subsequent work.
  7. Remove samples of installed work for testing when requested.
  8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- J. Patching:
  - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
    - a. This includes painted surfaces.
    - b. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
  - 2. Match color, texture, and appearance.
  - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

### **3.08 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### **3.09 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### **3.10 SYSTEM STARTUP**

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner 7 calendar days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

### **3.11 DEMONSTRATION AND INSTRUCTION**

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
- E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

### **3.12 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### **3.13 FINAL CLEANING**

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### **3.14 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
- B. Accompany Contractor on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

**3.15 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

**END OF SECTION 01 7000**

**SECTION 01 7327 - CUTTING AND PATCHING OF SINGLE PLY ROOFING****PART 1 - GENERAL****1.01 SUMMARY**

- A. This Section includes procedural requirements for cutting and patching.
  - 1. Related Sections include the following:
    - a. Divisions 2 through 28 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

**1.02 DEFINITIONS**

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

**1.03 SUBMITTALS**

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  - 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  - 3. Products: List products to be used and firms or entities that will perform the Work.
  - 4. Dates: Indicate when cutting and patching will be performed.
  - 5. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
  - 6. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.
- B. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
  - 1. If possible, retain original Installer to cut and patch exposed Work listed below:
    - a. EPDM Single Ply Membrane Roofing
    - b. TPO Single Ply Membrane Roofing
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

**1.04 WARRANTY**

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.
  - 1. Existing Roof: The existing roof is a roof system which is still under warranty. Comply with the following requirements when modifying the existing roof and adding new penetrations:
    - a. Notify original roof manufacturer prior to beginning any work and comply with all manufacturer guidelines and requirements.

- b. Provide original roof manufacturer with a brief description of the proposed work, including any required submittals.
- c. Work shall not begin until written approval is received from original roof manufacturer.
- d. Work must be done by an approved manufacturer's contractor.
- e. Original roof manufacturer shall inspect all modifications to the original roof system.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing 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.

### **3.03 PERFORMANCE**

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. Review proposed procedures with original Roof Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Proceed with patching after construction operations requiring cutting are complete.

### **3.04 ROOF FLASHING INSTALLATION AROUND NEW PENETRATIONS**

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of flashing sheet at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing as recommended by manufacturer.
- D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

- E. Terminate and seal top of sheet flashings.
- F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will eliminate evidence of patching and refinishing.

**END OF SECTION 01 7327**

**SECTION 01 7800 - CLOSEOUT SUBMITTALS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

**1.02 SUBMITTALS**

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

**PART 2 PRODUCTS - NOT USED****PART 3 EXECUTION****3.01 PROJECT RECORD DOCUMENTS**

- A. General:
  - 1. Project Record Documents include:
    - a. Complete set of Record Drawings.
    - b. Complete set of Record Submittals.
    - c. Complete set of Specifications.
  - 2. Project Record Documents shall be submitted in electronic form.
    - a. File Format: Portable Document Format (PDF).
    - b. Files shall be named and organized in a searchable, easy to understand, system.
  - 3. Ensure entries are complete and accurate, enabling future reference by Owner.
  - 4. Record information concurrent with construction progress.
- B. Record Drawings: Record Drawings shall include the following:
  - 1. Complete set of Drawings.
    - a. Indicate and record actual construction including, but not limited to, the following:
      - 1) Show all systems and assemblies as they exist at completion of the Work.
      - 2) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
      - 3) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
      - 4) Field changes of dimension and detail.
      - 5) Details not on original Contract drawings.
  - 2. Addenda.
  - 3. Change Orders and other modifications to the Contract.

- C. Record Submittals: Record Submittals shall include the following:
  - 1. Complete set of Submittals, including resubmittals.
  - 2. Shop Drawings shall indicate all field changes and other variations from the Submittal as originally reviewed by Architect.
- D. Specifications: Specifications shall include the following:
  - 1. Complete Project Manual including all specifications, front end material, reports, and information available to bidders, as originally bid.
  - 2. Addenda.
  - 3. Change Orders and other modifications to the Contract.

### **3.02 OPERATION AND MAINTENANCE DATA**

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  - 1. Product data, with catalog number, size, composition, and color and texture designations.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Additional information as specified in individual product specification sections.
- D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

### **3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS**

- A. For Each Item of Equipment and Each System:
  - 1. Description of unit or system, and component parts.
  - 2. Identify function, normal operating characteristics, and limiting conditions.
  - 3. Include performance curves, with engineering data and tests.
  - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.

- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Include test and balancing reports.
- N. Additional Requirements: As specified in individual product specification sections.

### **3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS**

- A. General:
  - 1. Operational and Maintenance Manuals include:
    - a. Operational and maintenance data.
    - b. Operational and maintenance data for materials and finishes.
    - c. Operational and maintenance data for equipment and systems.
  - 2. Operational and Maintenance Manuals shall be submitted both in electronic form and as hard copy/durable manuals.
    - a. Subject to Owner approval, hard copy/durable manuals may be omitted.
    - b. Electronic File Format: Portable Document Format (PDF).
      - 1) Files shall be named and organized in a searchable, easy to understand, system similar to the descriptions for the hard copy/durable manuals
- B. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- C. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- D. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 3 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- E. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- F. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- G. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- H. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- I. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- J. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- K. Arrangement of Contents: Organize each volume in parts as follows:
  - 1. Project Directory.
  - 2. Table of Contents, of all volumes, and of this volume.
  - 3. Operation and Maintenance Data: Arranged by system, then by product category.
    - a. Source data.
    - b. Operation and maintenance data.
    - c. Field quality control data.
    - d. Photocopies of warranties and bonds.

**3.06 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

**END OF SECTION 01 7800**

**SECTION 02 4100 - DEMOLITION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Selective demolition of building elements for alteration purposes.
- B. Salvaged items.
- C. Removed and reinstalled items.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry: Salvaging existing brick.

**1.03 REFERENCE STANDARDS**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

**1.05 QUALITY ASSURANCE**

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
  - 1. Minimum of 5 years of documented experience.

**PART 2 PRODUCTS - NOT USED****2.01 MATERIALS****PART 3 EXECUTION****3.01 SCOPE**

- A. Remove portions of existing building as indicated on Drawings including, but not limited to, the following:
  - 1. Roof assemblies to the extent shown
  - 2. Remove other items indicated, for salvage and relocation.

**3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Comply with other requirements specified in Section 01 7000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Comply with applicable requirements of NFPA 241.
  - 3. Prior to start of demolition operations, perform an engineering survey of building condition to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures.
  - 4. Provide, erect, and maintain temporary barriers and security devices.
  - 5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 6. Do not close or obstruct roadways or sidewalks without permit.
  - 7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
  - 8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- F. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, PCB's, and mercury.

**3.03 SELECTIVE DEMOLITION FOR ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as indicated.
  - 2. Report discrepancies to Architect before disturbing existing installation.
  - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from other areas that are still occupied.
  - 1. Provide, erect, and maintain temporary dustproof partitions of construction as specified and/or indicated on Drawings .
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- D. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove items indicated on Drawings.
- E. Services (Including but not limited to HVAC, Plumbing, and Electrical): Remove existing systems and equipment as indicated.
  - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
  - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
  - 3. Verify that abandoned services serve only abandoned facilities before removal.
  - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- F. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.
  - 4. Patch as specified for patching new work.

**3.04 SALVAGED ITEMS**

- A. Clean salvaged items.
- B. Pack or crate items after cleaning. Identify contents of containers.
- C. Store items in a secure area until delivery to Owner.
- D. Transport items to Owner's storage area on-site.
- E. Protect items from damage during transport and storage.

**3.05 REMOVED AND REINSTALLED ITEMS**

- A. Clean and repair items to functional condition adequate for intended reuse.
- B. Pack or crate items after cleaning and repairing. Identify contents of containers.
- C. Protect items from damage during transport and storage.
- D. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

**3.06 EXISTING ITEMS TO REMAIN**

- A. Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete

**3.07 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash from site.

- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION 02 4100**

**SECTION 03 3000 - CAST-IN-PLACE CONCRETE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Concrete formwork.
- B. Elevated concrete slabs.
- C. Concrete reinforcement.
- D. Joint devices associated with concrete work.
- E. Miscellaneous concrete elements, including other items as indicated on Drawings.
- F. Concrete curing.
- G. Products installed under this section:
  - 1. Manufactured reglets cast in concrete; furnished by Section 07 6200 - Sheet Metal Flashing and Trim.

**1.02 RELATED REQUIREMENTS****1.03 REFERENCE STANDARDS**

- A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- C. ACI 301 - Specifications for Concrete Construction; 2020.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- E. ACI 308R - Guide to External Curing of Concrete; 2016.
- F. ACI 347R - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- H. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2023.
- J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.
- K. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2023.
- L. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- M. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.
- N. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2024a.
- O. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.
- P. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.
- Q. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.
- R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.
- S. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.
- T. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork, and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2018 (Reapproved 2023).

- U. ASTM D8139 - Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction; 2023.
- V. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- W. NSF 372 - Drinking Water System Components - Lead Content; 2024.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Mix Design: Submit proposed concrete mix designs.
  - 1. Indicate where each mix design will be used.
- D. Concrete jointing plan, if not indicated on Drawings.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Field Quality Control Reports: Provide the following:
  - 1. F(F) Floor Flatness and F(L) Floor Levelness measurements as specified.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### **1.05 QUALITY ASSURANCE**

#### **1.06 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover the cost of flooring failures due to moisture migration from slabs for life of the concrete.
  - 1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.

### **PART 2 PRODUCTS**

#### **2.01 FORMWORK**

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
  - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
  - 2. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
    - a. Composition: Water-based, reactive, natural organic chemicals.
    - b. VOC Content: None; water-based.
    - c. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
      - 1) SpecChem, LLC; Bio Strip WB: [www.specchemllc.com](http://www.specchemllc.com).
      - 2) The Euclid Chemical Company; Formshield WB: [www.euclidchemical.com](http://www.euclidchemical.com).
      - 3) W. R. Meadows, Inc; Duogard II: [www.wrmeadows.com](http://www.wrmeadows.com).
  - 3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

#### **2.02 REINFORCEMENT MATERIALS**

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
  - 1. Type: Deformed billet-steel bars.
  - 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
  - 1. Form: Flat Sheets.

2. WWR Style: As indicated on drawings.
- C. Reinforcement Accessories:
  1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
  2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
  3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

### 2.03 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- F. Retarding Admixture: ASTM C494/C494M Type B.
- G. Water Reducing Admixture: ASTM C494/C494M Type A.
- H. Moisture Vapor Reduction Admixture (MVRA): ASTM C494/C494M, Type S; liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to permanently close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
  1. Products:
    - a. Barrier One, Inc; CPS Admix - Moisture Vapor Reduction Admixture (MVRA): [www.barrierone.com](http://www.barrierone.com).
    - b. ISE Logik Industries, Inc; MVRA 900: [www.iselogik.com](http://www.iselogik.com).
    - c. Specialty Products Group; Vapor Lock 20/20: [www.spggogreen.com](http://www.spggogreen.com).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

### 2.04 ACCESSORY MATERIALS

- A. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
  1. Grout: Comply with ASTM C1107/C1107M.
  2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
  3. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
  4. Low-Slump, Dry Pack Products:
    - a. Euclid Chemical Company; DRY PACK GROUT: [www.euclidchemical.com/#sle](http://www.euclidchemical.com/#sle).
    - b. Five Star Products, Inc; Five Star Grout: [www.fivestarproducts.com/#sle](http://www.fivestarproducts.com/#sle).
    - c. Substitutions: See Section 01 6000 - Product Requirements.

### 2.05 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
- B. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.
  1. Configuration: As indicated on drawings.
  2. Size: As indicated on drawings.
- C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
  1. Material: ASTM D1751, cellulose fiber.
  2. Material: ASTM D1752, recycled PVC (Type IV).
  3. Material: ASTM D8139, semi-rigid, closed-cell polypropylene foam.
  4. Products:
    - a. Oscoda Plastics, Inc; Proflex Vinyl Expansion Joints: [www.oscodaplastics.com](http://www.oscodaplastics.com).

- b. W. R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap:  
www.wrmeadows.com/#sle.
  - c. W. R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip:  
www.wrmeadows.com/#sle.
  - d. Substitutions: See Section 01 6000 - Product Requirements.
- D. Dowel Sleeves: Plastic sleeve for smooth, round, steel load-transfer dowels.

## 2.06 CURING MATERIALS

- A. Moisture-Retaining Sheet: ASTM C171.
  - 1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
  - 2. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- B. Water: Potable, not detrimental to concrete.

## 2.07 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
  - 1. Provide moisture vapor reduction admixture in slabs to receive adhesively applied flooring.
- C. Normal Weight Concrete:
  - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
  - 2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
  - 3. Cement Content: Minimum 470 pounds per cubic yard.
  - 4. Water-Cement Ratio: Maximum 45 percent by weight.
  - 5. Total Air Content: Determined in accordance with ASTM C173/C173M.
    - a. Concrete exposed to freeze thaw cycle: 6 percent, plus or minus 1 percent at point of delivery.
    - b. Hard troweled interior concrete: Do not exceed 3 percent.
  - 6. Maximum Slump: 4 inches (without admixtures).
  - 7. Maximum Aggregate Size: 1 inch.
- D. Concrete mix design requirements for concrete floor slabs to be stained and polished as specified in Section 03 3511 - Concrete Floor Finishes.
  - 1. Aggregates: Uniformly graded mix of not less than 3 aggregate sizes; fine, intermediate and large.
  - 2. Admixtures: Less than 1 to 2 percent of total mix weight.
  - 3. Materials replacing portions of portland cement shall not exceed 10 percent of the portland cement volume and should not be calcium chloride based. Includes, but is not limited to, the following:
    - a. Plasticizers.
    - b. Slag
    - c. Fly ash.
  - 4. Compressive Strength: 4,000 psi, minimum, at 28 days.
  - 5. Water-Cement Ratio: Maximum 45 percent by weight.

## 2.08 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

**3.02 PREPARATION**

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
  - 1. Use latex bonding agent only for non-load-bearing applications.
- E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

**3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS****3.04 CONCRETE REQUIREMENTS AT HARD TILE FLOOR FINISHES**

- A. Hard tile specified in Section 09 3000 - Tiling shall be installed on concrete floor slabs without control joints and slab jointing.
- B. Unless more stringent requirements are indicated, provide the following minimum requirements at concrete floor slabs where hard tile finishes shall be installed:
  - 1. Concrete Floor Slab Thickness: 5 inches.
  - 2. Reinforcement: No. 4 reinforcing steel (rebars) at 12 inches on center each way.
    - a. Fiber reinforcement is not permitted.
  - 3. Control Joints and Slab Jointing: None permitted.

**3.05 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 304R.
- B. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- D. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

**3.06 CONCRETE FINISHING**

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
  - 1. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
- D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.
- E. Exterior concrete platforms, steps, and ramps, and elsewhere as indicated shall have broom finish.
  - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
  - 2. Coordinate required final finish with Architect before application.

- F. Concrete polishing and staining See Section 03 3511.
- G. Concrete liquid densifier/hardener: See Section 03 3511 - Concrete Floor Finishes.

**3.07 CURING AND PROTECTION**

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
  - 1. Normal concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

**3.08 FIELD QUALITY CONTROL**

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

**3.09 DEFECTIVE CONCRETE**

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

**3.10 PROTECTION**

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

**END OF SECTION 03 3000**

**SECTION 04 0100 - MAINTENANCE OF MASONRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Water, Chemical, and Detergent cleaning of masonry surfaces.
- B. Repointing mortar joints.
- C. Repair of damaged masonry.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 2000 - Unit Masonry: Brick masonry units.
- B. Section 04 2000 - Unit Masonry: Mortar and grout.
- C. Section 04 2000 - Unit Masonry: Salvaging existing brick.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
  - 1. Require attendance of parties directly affecting work of this section.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on cleaning materials, mortar materials, masonry materials, and accessory materials .
- C. Quality Control Program: Provide for brick replacement and repointing work.
- D. Restorer qualifications.

**1.05 QUALITY ASSURANCE**

- A. Restorer: Company specializing in masonry restoration with minimum 5 years of documented experience.

**1.06 MOCK-UP**

- A. Restore and repoint an existing masonry wall area sized 8 feet long by 8 feet high; include in mock-up area instances of mortar, accessories, and brick replacement.
- B. Clean a 10 ft by 10 ft panel of wall to determine extent of cleaning.
  - 1. Mockups to include all cleaning methods proposed for use, including detergent cleaners, chemical cleaners, paint strippers, and biological cleaners.
- C. Locate where directed.
- D. Acceptable panel and procedures employed will become the standard for work of this section.
- E. Mock-up may remain as part of the Work.
- F. Do not begin Work until mock-ups are approved by Architect.

**1.07 FIELD CONDITIONS**

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

**PART 2 PRODUCTS****2.01 MANUFACTURERS****2.02 CLEANING MATERIALS**

- A. Water: Potable.
  - 1. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- B. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.
- C. Nonacidic Cleaner: Manufacturer's standard mildly alkaline gel cleaner formulated for removing mold, mildew, and other organic soiling from natural stone and cast stone as well as brick.
  - 1. Basis-of-Design: Sure Klean 942 Limestone & Marble Cleaner; Prosoco, Inc.

- D. Mild-acid Cleaner: Manufacturer's standard mildly acidic cleaner containing no muriatic (hydrochloric), hydrofluoric, or sulfuric acid; or ammonium bifluoride or chlorine bleaches.
  - 1. Basis-of-Design: Enviro Klean EK Restoration Cleaner; Prosoco, Inc.
- E. Paint Stripper: Manufacturer's standard neutral-PH gel stripper compound formulated for removing alkyd, acrylic, and graffiti paints from masonry.
  - 1. Basis-of-Design: Enviro Klean SafStrip 8; Prosoco, Inc.
- F. Biological Cleaner: Manufacturer's standard mildly acidic liquid cleaner for removing mold, mildew, and other biological soiling .
  - 1. Basis-of-Design: Enviro Klean Revive Prosoco, Inc.

### **2.03 MORTAR MATERIALS**

- A. Repointing Mortar: Type N.
  - 1. Conform to requirements of Section 04 2000 - Unit Masonry.
  - 2. Match existing mortar in color and texture.

### **2.04 MASONRY MATERIALS**

- A. Brick:
  - 1. Provide brick that matches, size, color and texture of exiting brick adjacent to the area to be repaired.
  - 2. Reuse salvaged existing brick for restoration and repair work to maximum extent possible in all visible locations. Use new brick only when quantities of existing brick are insufficient.

### **2.05 ACCESSORY MATERIALS**

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
  - 1. Basis-of-Design: Sure Klean Strippable Masking; Prosoco, Inc.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces to be cleaned and restored are ready for work of this section.

### **3.02 PREPARATION AND PROTECTION**

- A. Protect surrounding elements from damage due to restoration procedures.
- B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.
- C. Separate areas to be protected from restoration areas using means adequate to prevent damage.
- D. Cover existing landscaping with tarpaulins or similar covers.
- E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.
  - 1. When cleaning is completed, remove masking materials, leaving no residues that could trap dirt.
- F. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.
- G. Do not allow cleaning runoff to drain into sanitary or storm sewers.
- H. Neutralize alkaline and acid wastes before disposal.
- I. Do not apply chemical solutions during winds of enough force to spread them to unprotected surfaces.

**3.03 BRICK REMOVAL AND REPLACEMENT**

- A. Damaged Brick: Remove bricks that are damaged, cracked, spalled, or deteriorated. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
  - 1. When removing single bricks, remove material from center of brick and work toward outside edges.
  - 2. Cut out mortar by hand with chisel and mallet. Do not use power-operated grinders without Architect's written approval.
    - a. Submit quality-control program and demonstrated ability of operators to use power tools without damaging masonry. Quality-control program shall include provisions for supervising performance and preventing damage due to worker fatigue.
    - b. If Architect approves the use of small blade grinders, cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Do not use grinders on head joints. Remove remaining mortar by hand with chisel and mallet.
      - 1) Strictly adhere to written quality-control program.
- B. Loose Brick: Remove bricks that are loose and no longer bonded with mortar in an undamaged condition.
  - 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
  - 2. Store brick for reinstallation.
- C. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
- G. Lay replacement brick and reinstalled loose brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.
  - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
  - 2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.

**3.04 REPOINTING MASONRY**

- A. Rake out and repoint mortar joints to the following extent:
  - 1. All joints in areas indicated.
  - 2. Joints where mortar is missing or where they contain holes.
  - 3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
  - 4. Cracked joints where cracks are 1/8 inch or more in width and of any depth.
  - 5. Joints that sound hollow when tapped by metal object.
  - 6. Joints that are worn back 1/4 inch or more from surface.
  - 7. Joints that are deteriorated to point that mortar can be easily removed by hand.
  - 8. Joints, other than those indicated as sealant-filled joints, that have been filled with substances other than mortar.

- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows:
  - 1. Remove mortar from joints to depth of 2-1/2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, unweathered mortar.
  - 2. Remove mortar from brick and stone surfaces within raked-out joints to provide reveals with square backs and to expose brick and stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
  - 3. Do not spall edges of brick or stone units or widen joints. Replace or patch damaged masonry units as directed by Architect.
  - 4. Cut out mortar by hand with chisel and mallet. Do not use power-operated small blade grinders without Architect's written approval.
    - a. Submit quality-control program and demonstrated ability of operators to use power tools without damaging masonry. Quality-control program shall include provisions for supervising performance and preventing damage due to worker fatigue.
    - b. If Architect approves the use of small blade grinders cut out center of mortar bed joints using small blade angle grinders with diamond-impregnated metal blades. Do not use small blade grinders on head joints. Remove remaining mortar by hand with chisel and mallet.
      - 1) Strictly adhere to written quality-control program.
    - c. If damage occurs using angle grinders then cut out mortar by hand with chisel and mallet.
- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Point brick joints as follows:
  - 1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen masonry-joint surfaces before pointing.
  - 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
  - 3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks or stone units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar over edges onto exposed brick or stone surfaces or to featheredge mortar.
  - 4. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.
- F. Refer to Section 07 9200 - Joint Sealants for sealing stone joints.

### **3.05 MORTAR CURING**

- A. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.
- B. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
- C. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

### **3.06 MASONRY REPAIRS AND REPOINTING CLEANING - GENERAL**

- A. Immediately remove stains, efflorescence, or other excess resulting from brick replacement and repointing of masonry.
- B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

1. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.
- C. Clean surrounding surfaces.

### **3.07 CLEANING MASONRY - GENERAL**

- A. General: Begin with the mildest form of cleaning and proceed to harsher cleaning methods only after a milder method has not yielded the desired results. Subject to the substrate being cleaned, the cleaning methods from mildest to harshest are as follows:
  1. Detergent solution cleaning.
  2. Nonacidic chemical cleaning.
  3. Mild-acid chemical cleaning.
  4. Where above cleaning methods has proven not to completely remove paint or biological soiling in the mockups, use special paint strippers and biological cleaners to remove paint and biological soiling prior to cleaning methods indicated above.
- B. Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 10 feet away, subject to Architect's approval.
- C. Where brick replacement and repointing work precedes cleaning of existing brick and stone, allow mortar to fully set and cure.
  1. Allow mortar to harden at least 30 days before beginning cleaning work.
- D. Preliminary Cleaning: Prior to applying cleaning materials complete the following:
  1. Brush loose soil and plant debris from open joints.
  2. Carefully remove plants, creepers, and vegetation.
  3. Remove extraneous substances including paint, caulking, asphalt, and tar that are resistant to planned cleaning methods using scrapers.
    - a. Do not scratch or chip masonry surfaces.
- E. Proceed with cleaning in an orderly manner; work from bottom to top, and from one end of each elevation to the other.
  1. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.
  2. Keep wall wet below area being cleaned to prevent streaking from runoff.
- F. Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; use brush or spray application.
  1. Periodically during rinsing, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
    - a. Repeat rinsing until tested pH of water runoff is between 6.7 and 7.5.
- G. Pressure Spraying: Begin using a low pressure setting of between 50 and 100 psi and proceed to higher pressures only after a lower setting has not yielded the desired results. Do not exceed 500 psi, and stop immediately if damage occurs to masonry or masonry joints.
  1. Ensure that pressures used in the cleaning process do not cause additional damage to masonry surfaces and masonry joints.
  2. Mockups shall be used to determine proper pressures. Do not exceed pressures used in approved mockups.
  3. If damage continues to occur after mockup testing, stop work immediately and contact Architect.

### **3.08 DETERGENT CLEANING**

- A. Wet surface with cold water applied by low-pressure spray.
- B. Scrub surface with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
- C. Rinse with cold water applied by low-pressure spray to remove detergent solution and soil.

- D. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

### **3.09 NONACIDIC CHEMICAL CLEANING.**

- A. Wet surface with cold water applied by low-pressure spray.
- B. Apply gel cleaner by brush, working into joints and crevices. Apply quickly and do not brush out excessively, so area is uniformly covered with fresh cleaner and dwell time is uniform throughout area being cleaned.
- C. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer.
- D. Remove bulk of gel cleaner.
- E. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
- F. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once.

### **3.10 MILD-ACID CHEMICAL CLEANING**

- A. Wet surface with cold water applied by low-pressure spray.
- B. Apply cleaner to surface by brush or low-pressure spray.
- C. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer.
- D. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
- E. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once.

### **3.11 PAINT STRIPPING**

- A. Wet surface with cold water applied by low-pressure spray.
- B. Apply gel stripper by brush. Apply quickly and do not brush out excessively, so area is uniformly covered with fresh cleaner and dwell time is uniform throughout area being cleaned.
- C. Let stripper remain on surface for period recommended in writing by stripper manufacturer. Periodically agitate with brush.
- D. Rinse with hot water applied by low-pressure spray to remove chemicals and soil.
- E. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

### **3.12 BIOLOGICAL CLEANING**

- A. Wet surface with cold water applied by low-pressure spray.
- B. Apply cleaner to surface by brush or low-pressure spray.
- C. Let cleaner remain on surface for period recommended in writing by cleaner manufacturer. Periodically agitate with brush to loosen biological soiling.
- D. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
- E. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

**END OF SECTION 04 0100**

**SECTION 04 4316 - STONE FABRICATIONS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fabricated oolitic limestone items.
- B. Metal anchors and supports.
- C. Sealing exterior joints.
- D. Pointing joints.

**1.02 RELATED REQUIREMENTS**

- A. Section 04 0100 - Maintenance of Masonry

**1.03 REFERENCE STANDARDS**

- A. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.
- B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- C. ASTM C119 - Standard Terminology Relating to Dimension Stone; 2022.
- D. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- E. ASTM C568/C568M - Standard Specification for Limestone Dimension Stone; 2022.
- F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.
- I. ASTM C1528/C1528M - Standard Guide for Selection of Dimension Stone; 2020.
- J. ILI (HB) - Indiana Limestone Handbook; 2007.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene one week before starting work of this section.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Samples: Submit two stone samples 4 by 4 inches in size, indicating color range and texture, markings, surface finish.
- C. Samples: Submit mortar color samples.
- D. Installation Instructions: Submit stone fabricator's installation instructions and field erection or setting drawings; indicate stone identifying marks and locations on setting drawings.
- E. Stone fabricator's qualification statement.
- F. Installer's qualification statement.

**1.06 QUALITY ASSURANCE**

- A. Design anchors and supports under direct supervision of a Professional Structural Engineer, registered in the State in which the Project is located.
  - 1. Design anchors to resist positive and negative wind pressures and other loads as required by applicable code.
  - 2. Design anchor attachment to stone with a factor of safety of 5:1.
  - 3. Design each individual anchor with a factor of safety in the vertical dead-load-bearing direction of 4:1 and in the horizontal lateral-load-bearing direction of 2:1.
- B. Limestone: Perform work in accordance with ILI (HB).
- C. Maintain one copy of each document on site.
- D. Stone Fabricator: Company specializing in fabricating stone with minimum ten years of documented experience.

- E. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

### **1.07 MOCK-UPS**

- A. Construct stone fabrication mock-up, \_\_\_\_ feet long by \_\_\_\_ feet wide, including stone anchor accessories, flashings, typical control joints, and \_\_\_\_.
- B. Locate where directed.
- C. Mock-up may remain as part of the work.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Store stone on planks, pallets, or timbers, clear of soil and soil splash.
- B. Protect stone from discoloration.

## **PART 2 PRODUCTS**

### **2.01 FABRICATED ITEMS**

- A. Wall Caps and Copings: Oolitic limestone.
  - 1. Size, Shape, and Configuration: As indicated on drawings.
- B. Water Tables: Oolitic limestone.
  - 1. Size, Shape, and Configuration: As indicated on drawings.

### **2.02 STONE**

- A. Stone, General: See recommendations in ASTM C1528/C1528M.
- B. Oolitic Limestone: Indiana Oolitic Limestone; complying with ASTM C568/C568M Classification II - Medium Density.
  - 1. Grade: ILI Standard.
  - 2. Color: Buff.
  - 3. Grain Direction: Vertical.
  - 4. Surface Finish: To match adjacent stone; as described in ASTM C119 and ASTM C1528/C1528M.

### **2.03 MORTAR**

- A. Mortar: ASTM C270, Type N, Proportion specification, using Portland cement of gray color.

### **2.04 ANCHORS AND ACCESSORIES**

- A. Anchors and Other Components in Contact with Stone: Stainless steel, ASTM A666 Type 304.
  - 1. Sizes and configurations: As required for vertical and horizontal support of stone and applicable loads.
  - 2. Wire ties are not permitted.
- B. Support Components not in Contact with Stone: Stainless steel, ASTM A240/A240M Type 304.
- C. Setting Buttons and Shims: Lead type.
- D. Joint Sealant: ASTM C920 silicone sealant with movement capability of at least plus/minus 25 percent and nonstaining to stone when tested in accordance with ASTM C1248.
- E. Joint Backer Rod: ASTM C1330 open cell polyurethane of size 40 to 50 percent larger in diameter than joint width.

### **2.05 STONE FABRICATION**

- A. Fabricate stone elements in sizes and shapes as necessary and in compliance with requirements indicated on drawings and in specifications.
- B. Finish exposed faces and edges of stones in compliance with indicated requirements for finish under each type and application of stone required and to match approved samples and mock-ups.
- C. Fabricate units for uniform coloration between adjacent units and over the full area of the installation.

- D. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that support work and site conditions are ready to receive work of this section.
- B. Verify that built-in items are properly located and sized.

#### **3.02 PREPARATION**

- A. Clean stone prior to erection. Do not use wire brushes or implements that will mark or damage exposed surfaces.

#### **3.03 INSTALLATION**

- A. Set stone with a consistent joint width of 3/8 inch.
- B. Joints in Exterior Work: Seal joints with joint sealant over backer rod, following sealant manufacturer's instructions; tool sealant surface to concave profile.

#### **3.04 TOLERANCES**

- A. Positioning of Elements: Maximum 1/4 inch from true position.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet; 1/2 inch in 50 feet.
- C. Maximum Variation Between Face Plane of Adjacent Panels: 1/16 inch.
- D. Maximum Variation from Plumb: 1/4 inch per story noncumulative; 1/2 inch in any two stories.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.
- F. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

#### **3.05 CUTTING AND FITTING**

- A. Obtain approval prior to cutting or fitting any item not so indicated on drawings.
- B. Do not impair appearance or strength of stone work by cutting.

#### **3.06 CLEANING**

- A. Remove excess joint material upon completion of work.
- B. Clean soiled surfaces with cleaning solution.
- C. Use nonmetallic tools in cleaning operations.

### **END OF SECTION 04 4316**

**SECTION 05 5000 - METAL FABRICATIONS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Shop fabricated steel items, including:
  - 1. Steel framing supports for the following:
    - a. Roof openings.
    - b. Other items as indicated on Drawings.

**1.02 REFERENCE STANDARDS**

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- K. SSPC-SP 2 - Hand Tool Cleaning; 2024.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
  - 2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- D. Designer's Qualification Statement.
- E. Fabricator's Qualification Statement.

**1.04 QUALITY ASSURANCE**

- A. Design metal fabrications under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Fabricator: Company specializing in performing the work of this section with minimum 5years of documented experience.

**PART 2 PRODUCTS****2.01 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M, Grade B, cold-formed or ASTM A501/A501M hot-formed structural tubing.

- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black and hot-dip galvanized finish, as indicated.
- E. Bolts, Nuts, and Washers: ASTM A307, Grade A, galvanized to ASTM A153/A153M where connecting galvanized components.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

## **2.02 FABRICATION - GENERAL**

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

## **2.03 MISCELLANEOUS FRAMING AND SUPPORTS**

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
- C. Finish: Prime painted unless otherwise indicated or at an exterior location.
- D. Fabricate support for suspended toilet partitions as follows:
  - 1. Beams: Continuous steel shapes of size required to limit deflection to L/360 between hangers, but use not less than C8x11.5 channels or another shape with equivalent structural properties.
  - 2. Hangers: Steel rods, 1/2 inch in diameter, spaced not more than 36 inches o.c.
    - a. Thread rods to receive anchor and stop nuts.
    - b. Fit hangers with wedge shape washers for full bearing on sloping flanges of support beam.
  - 3. Braces and Angles: Steel angles of size required to rigidly brace and support beams.
- E. Roof Openings: Unless otherwise indicated, provide steel support framing for roof openings as follows:
  - 1. Provide steel support framing around entire perimeter of roof opening; span support framing between primary framing or purlins.
  - 2. Size steel framing not less than the following for spans indicated:
    - a. Up to 5 feet: C4x5.4 or L4x4x1/4.
    - b. 5 to 7 feet: C5x6.7 or L5x3-1/2x1/4 (LLV).
    - c. 7 to 10 feet: C6x8.2 or L6x3-1/2x5/16 (LLV).
    - d. Refer to Drawings for conditions other than those listed above.
  - 3. Limit deflection to L/240.

## **2.04 MISCELLANEOUS**

- A. Protective Coating: Zinc molybdate alkyd.

- B. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

### **2.05 FINISHES - STEEL**

- A. Prepare surfaces to be primed in accordance with SSPC-SP2.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Prime Painting: One coat.
  - 1. Provide at all fabrications except at galvanized locations and where otherwise indicated.
- D. Where indicated, galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
  - 1. Locations: All exterior locations and elsewhere as indicated.
- E. Where indicated, galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
  - 1. Locations: All exterior locations and elsewhere as indicated.

### **2.06 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

### **3.03 INSTALLATION - GENERAL**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on shop drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

### **3.04 MISCELLANEOUS FRAMING AND SUPPORTS**

- A. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

### **3.05 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

## **END OF SECTION 05 5000**

**SECTION 06 1000 - ROUGH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Nonstructural dimension lumber framing.
- B. Roofing nailers.
- C. Preservative treated wood materials.
- D. Fire retardant treated wood materials.
- E. Miscellaneous framing and sheathing.
- F. Concealed wood blocking, nailers, and supports.
- G. Miscellaneous wood nailers, furring, and grounds.

**1.02 REFERENCE STANDARDS**

- A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.
- B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2024).
- D. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.
- G. PS 1 - Structural Plywood; 2023.
- H. PS 20 - American Softwood Lumber Standard; 2025.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

**PART 2 PRODUCTS****2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. Species: Unless otherwise indicated, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
  - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at [www.alsc.org](http://www.alsc.org), and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

**2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: Kiln-dry or MC15.

- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Grade No. 2.

### **2.03 CONSTRUCTION PANELS**

- A. Roof Sheathing: Plywood, PS 1, Grade C-C.
  - 1. Panel Grade: APA Rated; Structural I Sheathing.
  - 2. Span Rating: 48/24.
  - 3. Bond Classification: Exterior.
  - 4. Performance Category: 3/4.
  - 5. Thickness: 3/4 inch unless otherwise indicated.
  - 6. Tongue-and-groove edges.
- B. Other Applications:
  - 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
  - 2. Concealed Plywood in Other Locations: PS 1, C-D Plugged or better.

### **2.04 ACCESSORIES**

- A. Fasteners and Anchors:
  - 1. Metal and Finish: Stainless steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
  - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
  - 3. Anchors:
    - a. Toggle bolt type for anchorage to hollow masonry.
    - b. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
    - c. Bolt or ballistic fastener for anchorages to steel
- B. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.
  - 1. Manufacturers:
    - a. Franklin International, Inc; Titebond GREENchoice Heavy Duty Construction Adhesive: [www.titebond.com](http://www.titebond.com).
    - b. Liquid Nails, a brand of PPG Industries, Inc.; LN-903 Heavy Duty Construction Adhesive (Low VOC): [www.liquidnails.com](http://www.liquidnails.com).
    - c. Substitutions: See Section 01 6000 - Product Requirements.

### **2.05 FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
  - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
  - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Fire Retardant Treatment:
  - 1. Manufacturers:
    - a. Lonza Group: [www.wolmanizedwood.com](http://www.wolmanizedwood.com).
    - b. Hoover Treated Wood Products, Inc: [www.frtw.com](http://www.frtw.com).
    - c. Koppers, Inc: [www.koppersperformancechemicals.com](http://www.koppersperformancechemicals.com).
    - d. Viance, LLC: [www.treatedwood.com](http://www.treatedwood.com).
    - e. Substitutions: See Section 01 6000 - Product Requirements.

2. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
    - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    - b. Treat lumber in locations as indicated
  3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
    - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    - b. Interior rough carpentry items are to be fire retardant treated.
- C. Preservative Treatment:
1. Manufacturers:
    - a. Lonza Group: [www.wolmanizedwood.com](http://www.wolmanizedwood.com).
    - b. Hoover Treated Wood Products, Inc: [www.frtw.com](http://www.frtw.com).
    - c. Koppers Performance Chemicals, Inc: [www.koppersperformancechemicals.com](http://www.koppersperformancechemicals.com).
    - d. Viance, LLC: [www.treatedwood.com](http://www.treatedwood.com).
    - e. Substitutions: See Section 01 6000 - Product Requirements.
  2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
    - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
    - b. Treat lumber exposed to weather.
    - c. Treat lumber in contact with roofing, flashing, or waterproofing.
      - 1) At Contractor's option, roof nailers may be non-preservative treated.
    - d. Treat lumber in contact with masonry or concrete.
    - e. Treat lumber less than 18 inches above grade.
    - f. Treat lumber in other locations as indicated.
  3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
    - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
    - b. Treat plywood in contact with roofing, flashing, or waterproofing.
    - c. Treat plywood in contact with masonry or concrete.
    - d. Treat plywood less than 18 inches above grade.
    - e. Treat plywood in other locations as indicated.
  4. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
  5. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

### **3.02 INSTALLATION - GENERAL**

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

### **3.03 MISCELLANEOUS FRAMING**

- A. Install miscellaneous framing level, plumb, and true to line.
- B. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
- C. Install horizontal spanning members with crown edge up and not less than 3 inches of bearing at each end.

### **3.04 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

### **3.05 ROOF-RELATED CARPENTRY**

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

### **3.06 PARAPET CAP FRAMING**

### **3.07 INSTALLATION OF CONSTRUCTION PANELS**

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
  - 1. Screw panels to framing; staples are not permitted.

### **3.08 SITE APPLIED WOOD TREATMENT**

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

### **3.09 TOLERANCES**

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

### **3.10 CLEANING**

- A. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.

### **END OF SECTION 06 1000**

**SECTION 07 0150.19 - PREPARATION FOR RE-ROOFING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Replacement of existing roofing system in preparation for entire new roofing system.
- B. Partial replacement of existing roofing system in preparation for replacement roofing system in designated areas as indicated on drawings.
- C. Re-cover of existing roofing system in preparation for entire new roofing system.
- D. Removal of existing flashing and counterflashings.

**1.02 REFERENCE STANDARDS**

- A. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.
- B. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing; 2016a (Reapproved 2023).
- C. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2023).
- D. ASTM D4601/D4601M - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing; 2004 (Reapproved 2020).

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate with affected mechanical and electrical work associated with roof penetrations.
- B. Schedule work to coincide with commencement of installation of new roofing system.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit for each type of material.

**1.05 QUALITY ASSURANCE**

- A. Materials Removal Company Qualifications: Company specializing in performing work of type specified with at least three years of documented experience.
  - 1. Comply with removal and disposal regulations of local authorities having jurisdiction (AHJ).

**1.06 FIELD CONDITIONS**

- A. Existing Roofing System: Built-up asphalt roofing.
- B. Do not remove existing roofing membrane when weather conditions threaten the integrity of building contents or intended continued occupancy.
- C. Maintain continuous temporary protection prior to and during installation of new roofing system.
- D. Provide notice at least three days before starting activities that will affect normal building operations.
- E. Verify that occupants have been evacuated from building areas when work on structurally impaired roof decking is scheduled to begin.
- F. Owner will occupy building areas directly below re-roofing area.
  - 1. Provide Owner with at least 48 hours written notice of roofing activities that may affect their operations and to allow them to prepare for upcoming activities as necessary.

**1.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Existing Warranties: Perform this work using methods and materials that will maintain existing roof system warranties.
  - 1. Notify existing roof system warrantor prior to starting this work and obtain written instructions for procedures necessary to maintain this existing warranty.
  - 2. Upon completion of this work, notify warrantor of reroofing completion and obtain documentation to verify that existing roofing system has been inspected and warranty is still in effect.

- a. Submit documentation upon project closeout.

## **PART 2 PRODUCTS**

### **2.01 COMPONENTS**

- A. Refer to following sections for additional information on components relating to this work:
  1. Replacement and removal of existing roofing system in preparation for entire new roofing system, see Section 07 5100.
  2. Partial removal of existing roofing system in preparation for new roofing system in designated areas as indicated on drawings, see Section 07 5100.
  3. Recovering of existing roofing system in preparation for entire new roofing system, see Section 07 5100.
  4. Remove existing flashing and counterflashings in preparation for replacement of these materials as part of this work, see Section 07 6200 for material requirements.

### **2.02 MATERIALS**

- A. Patching Materials: Provide necessary materials in accordance with requirements of existing roofing system.
- B. Roofing Recover Materials:
  1. Contractor's responsibility to select appropriate materials for roofing re-cover as determined necessary for this work.

### **2.03 ACCESSORIES**

- A. Fasteners: Type and size as required and compatible with existing and new roofing system to resist local wind uplift.
- B. Sheathing Paper: Red rosin paper type, at least 3 lb per 100 sq ft.
- C. Base Sheet: Non-perforated, asphalt-coated glass fiber base sheet, Type II in accordance with ASTM D4601/D4601M.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

### **3.02 PREPARATION**

- A. Sweep roof surface clean of loose matter.
- B. Remove loose refuse and dispose of properly off-site.

### **3.03 MATERIAL REMOVAL**

- A. Remove only existing roofing materials that can be replaced with new materials the same day.
- B. Remove metal counter flashings.
- C. Scrape roofing gravel from membrane surface without causing serious damage to membrane felts.
- D. Remove damaged portions of roofing membrane, perimeter base flashings, flashings around roof protrusions, pitch pans and pockets, insulation vents, and \_\_\_\_\_.
- E. Cut and lay flat any membrane blisters.
- F. Remove damaged insulation and fasteners, cant strips, and blocking.

### **3.04 INSTALLATION**

- A. Coordinate scope of this work with requirements for installation of new roofing system, see Section 07 5100 for additional requirements.

### **3.05 FIELD QUALITY CONTROL**

- A. Inspection firm will identify the exact limits to material removal.

### **3.06 PROTECTION**

- A. Provide protection of existing roofing system that is not having work performed on it.

B. Install recover board over existing membrane.

**END OF SECTION 07 0150.19**

**SECTION 07 3113 - ASPHALT SHINGLES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Asphalt shingle roofing.
- B. Underlayment.
- C. Ridge vents.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings and drip edges.

**1.03 REFERENCE STANDARDS**

- A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- C. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2020.
- D. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules; 2023.
- E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2024).
- F. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing; 2016a (Reapproved 2025).
- G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- H. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2020a.
- I. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2021.
- J. NRCA (RM) - The NRCA Roofing Manual; 2025.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating material characteristics.
- C. Shop Drawings: For metal flashings, indicate specially configured metal flashings.
- D. Samples:
  - 1. Ridge Vent: Submit three 12 inch long samples.
  - 2. Underlayment: Submit three 4 inch by 4 inch samples of each type.
  - 3. Shingles: Submit three samples of each shingle color indicating color range and finish texture/pattern.
- E. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Shingles: 100 sq ft of each type and color.

**1.05 MOCK-UP**

- A. Provide mock-up of 100 sq ft, including underlayment, shingles, associated flashings, and ridge vent.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

**1.06 FIELD CONDITIONS**

- A. Do not install shingles or underlayment when surface or ambient air temperatures are below 45 degrees F.

**1.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Material Warranty: Provide 40 year shingle material warranty, from date of Substantial Completion, prorated, with first five years nonprorated.
- C. Wind-Speed Warranty: Provide five warranty, from date of Substantial Completion, against shingle blow-off or damage caused by wind speeds up to Warranted Wind Speed specified.

**PART 2 PRODUCTS****2.01 ASPHALT SHINGLES**

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
  - 1. Fire Resistance: Class A, complying with ASTM E108.
  - 2. Wind Resistance: Class F, when tested in accordance with ASTM D3161/D3161M.
  - 3. Warranted Wind Speed: Not greater than 110 mph.
  - 4. Self-sealing type.
  - 5. Style: Laminated overlay.
  - 6. Color: As selected by Architect.
- B. Specialty Shingles: Provide starter shingles and hip and ridge shingles.
- C. Products:
  - 1. CertainTeed Corp., Saint-Gobain: Landmark PRO: [www.certainteed.com](http://www.certainteed.com).
  - 2. GAF; Timberline HD: [www.gaf.com](http://www.gaf.com).
  - 3. Owens Corning; Duration: [www.owenscorning.com](http://www.owenscorning.com).
  - 4. TAMKO Building Products, Inc.; Heritage Premium: [www.tamko.com](http://www.tamko.com).
  - 5. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 SHEET MATERIALS**

- A. Underlayment: Self-adhering rubber-modified asphalt sheet conforming to ASTM D1970/D1970M; 40 mil total thickness; with strippable release film and granular top surface.
  - 1. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
  - 2. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
  - 3. Water Vapor Permeance: 0.1 perms, when tested in accordance with ASTM E96/E96M, Procedure A (desiccant method).
  - 4. Liquid Water Transmission: Passes ASTM D4869/D4869M.
  - 5. Products:
    - a. CertainTeed Corp., Saint-Gobain: WinterGuard Granular: [www.certainteed.com](http://www.certainteed.com).
    - b. GAF; WeatherWatch Mineral-Surfaced Leak Barrier: [www.gaf.com](http://www.gaf.com).
    - c. GCP; Grace Ice & Water Shield Roofing Underlayment: [www.gcpat.com](http://www.gcpat.com)
    - d. Owens Corning; WeatherLock G: [www.owenscorning.com](http://www.owenscorning.com).
    - e. TAMKO Building Products, Inc.; Moisture Guard: [www.tamko.com](http://www.tamko.com).
    - f. Substitutions: See Section 01 6000 - Product Requirements.
- B. Underlayment: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D226/D226M, Type II ("No.30").

**2.03 ACCESSORIES**

- A. Roofing Nails: Standard round wire shingle type, galvanized steel or stainless steel, minimum 3/8 inch head diameter, 12 gage, 0.109 inch nail shank diameter, 1-1/2 inch long and conforming to ASTM F1667.
- B. Plastic Cement: ASTM D4586/D4586M, asphalt roof cement.
- C. Plastic Ridge Vents: Extruded plastic with filtered vent openings that do not permit direct water or weather entry; flanged to receive shingles.

1. Section Lengths: 4 feet.
  2. Height: 1 inch, maximum.
  3. Ventilation: 18 inches, minimum, net free area per linear foot.
  4. Roof Pitch: 3:12 to 16:12.
  5. Color: Black.
  6. Products:
    - a. CertainTeed Corp., Saint-Gobain: Ridge Vent - 12" Filtered; [www.certainteed.com](http://www.certainteed.com).
    - b. GAF; Cobra Snow Country Exhaust Vent for Roof Ridge: [www.gaf.com](http://www.gaf.com).
    - c. Owens Corning; VentSure 4-Foot Strip Ridge Vent: [www.owenscorning.com](http://www.owenscorning.com).
    - d. TAMKO Building Products, Inc.; Coolridge Sectional Ridge Vent: [www.tamko.com](http://www.tamko.com).
    - e. Substitutions: See Section 01 6000 - Product Requirements.
- D. Low Profile Linear Vent: Tapered, under-shingle plastic vent that allows air to freely flow through roof decking slit providing adequate ventilation.
1. Opening size: 1 inch wide.
  2. Piece size: 10 1/2 inches wide x 36 inches long
  3. Ventilation: 9 square inches per unit.
  4. Roof Pitch: 3:12 to 12:12.
  5. Products:
    - a. DCI Products: SmartVent-Tapered Under Shingle Attic Ventilation: [www.dciproducts.com](http://www.dciproducts.com)
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Roof Louver Vent: Slant back roof vent that exhausts heat and moisture from attic to protect the roof system from deterioration, decreases attic heat and restricts weater infiltration.
1. Opening size: 10 inches.V.I.F.
  2. Vent size: 12 inches x 12 inches
  3. Ventilation: 60 square inches per unit.
  4. Colo
  5. Roof Pitch: 3:12 or greater
  6. Products:
    - a. GAF; Master Flow Roof Louver - Galvanized Slant Back SSB960G. [www.gaf.com](http://www.gaf.com).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

## 2.04 METAL FLASHINGS

- A. Metal Flashings: Provide sheet metal drip edges and other flashing indicated.
1. Form flashings to profiles indicated on drawings.
  2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
  3. Hem exposed edges of flashings minimum 1/4 inch on underside.
  4. Coat concealed surfaces of flashings with bituminous paint.
- B. Aluminum Sheet Metal: Prefinished aluminum, 26 gauge, 0.017 inch minimum thickness; stucco embossed, PVC coating, color as selected.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.
- B. Verify deck surfaces are dry, free of ridges, warps, or voids.

### 3.02 PREPARATION

- A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.
- B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.
- C. Broom clean deck surfaces before installing underlayment or eave protection.
- D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with plastic cement, and secure flange with nails spaced \_\_\_\_ inches on center.

**3.03 INSTALLATION - UNDERLAYMENT**

- A. General: Install underlayment according to manufacturer's instructions and as specified.
  - 1. Underlayments shall weather lap metal drip edges.
- B. Install self-adhering sheet underlayment with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer.
  - 1. Install without wrinkles; overlapping edges shall be sealed tightly without gaps.
  - 2. Locations:
    - a. Eaves: Extend from edges of eaves, 24 inches beyond interior face of exterior wall.
    - b. Rakes: Extend from edges of rakes, 24 inches beyond interior face of exterior wall.
    - c. Valleys: Extend from lowest to highest point 18 inches on each side.
    - d. Hips: Extend 18 inches on each side.
    - e. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent opening.
    - f. Openings and Penetrations: Extend beyond penetrating element 18 inches, and return vertically against penetrating element not less than 4 inches.
    - g. Sidewalls: Extend beyond penetrating element 18 inches, and return vertically against sidewall not less than 4 inches.
    - h. Roof Slope Transitions: Extend 18 inches on each roof slope.
- C. Install roofing felt underlayment parallel to roof deck with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer. Secure with roofing nails.
  - 1. Lap sides of felt underlayment over self-adhering sheet underlayment not less than 4 inches in direction that sheds water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.
  - 2. Install without wrinkles.
  - 3. Locations:
    - a. All areas not covered by self-adhering sheet underlayment.

**3.04 INSTALLATION - METAL FLASHING AND ACCESSORIES**

- A. Refer to Section 07 6200 - Sheet Metal Flashing and Trim.

**3.05 INSTALLATION - SHINGLES**

- A. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
  - 1. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
  - 2. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
- B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
- C. At eaves, project first course of shingles 3/4 inch beyond edge of roof sheathing and metal drip edges..
- D. At rakes, extend shingles 1/2 inch beyond edge of roof sheathing and metal drip edges
- E. Extend shingles on one slope across valley and fasten, trim shingles from other slope 2 inches from valley center line to achieve closed cut valley, and concealing valley protection.
  - 1. Set trimmed asphalt shingles in a 3 inch wide bed of plastic cement.
- F. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing
- G. Cap hips and ridges with individual shingles, maintaining 5 inch weather exposure, and place to avoid exposed nails.
  - 1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.
- H. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.

I. Complete installation to provide weather tight service.

**3.06 PROTECTION**

A. Do not permit traffic over finished roof surface.

**END OF SECTION 07 3113**

**SECTION 07 5400 - THERMOPLASTIC MEMBRANE ROOFING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Adhered system with thermoplastic roofing membrane.
- B. Cover boards.
- C. Flashings.

**1.02 REFERENCE STANDARDS**

- A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.
- C. ASTM D6754/D6754M - Standard Specification for Ketone Ethylene Ester Based Sheet Roofing; 2015.
- D. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011 (Reapproved 2019).
- E. FM (AG) - FM Approval Guide; Current Edition.
- F. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2024).
- G. NRCA (RM) - The NRCA Roofing Manual; 2025.
- H. NRCA (WM) - The NRCA Waterproofing Manual; 2021.
- I. UL (FRD) - Fire Resistance Directory; Current Edition.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene one week before starting work of this section.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, surfacing, and fasteners.
- C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
- D. Samples for Verification: Submit two samples 12 by 12 inches in size illustrating insulation and colored coating.
- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Specimen Warranty: For approval.
- J. Warranty Documentation:
  - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
  - 2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

1. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value.
  - a. Calculate SRI in accordance with ASTM E1980.
  - b. Field applied coating may not be used to achieve specified SRI.
2. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
3. Insulation Thermal Resistance (R-Value): 3 per inch, minimum; provide insulation of thickness required.

### **2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS**

- A. Membrane Roofing Materials:
  1. KEE: Ketone ethylene ester (KEE) complying with ASTM D6754/D6754M, sheet reinforced with fabric.
    - a. Thickness: 36 mil, 0.036 inch, minimum.
  2. Sheet Width:
    - a. Adhered Application: Limit width to 120 inches, maximum, when ambient temperatures are less than 40 degrees F for extended period of time during installation.
  3. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane.

### **2.04 COVER BOARDS**

- A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
  1. Thickness: 5/8 inch, Type X, fire-resistant.
  2. Products:
    - a. Georgia-Pacific; DensDeck: [www.densdeck.com/#sle](http://www.densdeck.com/#sle).
    - b. Gold Bond Building Products, LLC provided by National Gypsum Company; DEXcell Glass Mat Roof Board: [www.goldbondbuilding.com/#sle](http://www.goldbondbuilding.com/#sle).
    - c. Substitutions: See Section 01 6000 - Product Requirements.

### **2.05 INSULATION**

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
  1. Classifications:
    - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
      - 1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
      - 2) Compressive Strength: Classes 1-2-3, Grade 1, 16 psi (110 kPa), minimum.
      - 3) Thermal Resistance, R-value: At 1-1/2 inches thick; Class 1, Grades 1-2-3, 8.4 (1.48), minimum, at 75 degrees F.
  2. Board Size: 48 by 96 inches.
  3. Board Thickness: 1.5 inches.
  4. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
  5. Board Edges: Square.
  6. Products:
    - a. DuPont de Nemours, Inc: [building.dupont.com/#sle](http://building.dupont.com/#sle).
    - b. GAF; EnergyGuard Polyiso Insulation: [www.gaf.com/#sle](http://www.gaf.com/#sle).
    - c. Mule-Hide Products Co, Inc; Poly ISO Flat: [www.mulehide.com/#sle](http://www.mulehide.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

### **2.06 ACCESSORIES**

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Cant and Edge Strips: Wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle.

- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. Do not install more insulation than can be covered with membrane in same day.

### **3.05 INSTALLATION - MEMBRANE**

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate of \_\_\_ gallons per square foot. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. At intersections with vertical surfaces:
  - 1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
  - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and sumps and related flashings.

### **3.06 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.

### **3.07 CLEANING**

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

### **3.08 PROTECTION**

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

**END OF SECTION 07 5400**

**SECTION 07 5423 - TPO MEMBRANE ROOFING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Thermoplastic polyolefin (TPO) roofing assembly; fully adhered. Including, but not limited to, the following:
  - 1. Cover board.
  - 2. Insulation, flat and tapered.
  - 3. Walkway pads.

**1.02 ABBREVIATIONS**

- A. TPO: Thermoplastic polyolefin.

**1.03 REFERENCE STANDARDS**

- A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- B. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2024.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.
- D. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008 (Reapproved 2023).
- E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- F. ASTM D5602/D5602M - Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens; 2018 (Reapproved 2022).
- G. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.
- H. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).
- I. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- K. FM (AG) - FM Approval Guide; Current Edition.
- L. FM 4470 - Examination Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction; 2022.
- M. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2024).
- N. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; 2016, with Editorial Revision (2022).
- O. FM DS 1-49 - Perimeter Flashing; 2016.
- P. NRCA (RM) - The NRCA Roofing Manual; 2025.
- Q. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate with installation of associated counterflashings installed under other sections.
- B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- B. Source Limitations: Obtain roof membrane from one of the named Roof Assembly manufacturers and provide related roofing assembly components from either the roof membrane manufacturer or one of the listed product manufacturers; subject to approval of roof membrane manufacturer.

## 2.02 ROOFING ASSEMBLY

- A. Single-ply membrane roofing assembly consisting of the following:
  - 1. TPO single-ply roof membrane; fully adhered.
  - 2. Cover board; fully adhered.
  - 3. Insulation, including tapered insulation; first layer mechanically fastened, all subsequent layers fully adhered.
  - 4. Walkway pads.
- B. Performance Requirements:
  - 1. Comply with Factory Mutual (FM) Global and FM Approvals' RoofNav Listing requirements as follows:
    - a. Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals FM 4450 or FM Approvals FM 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
      - 1) Fire/Windstorm Classification: Class 1A-90.
      - 2) Hail-Resistance Rating: SH.
    - b. Comply with the following Property Loss Prevention Data Sheets:
      - 1) Data Sheet FM DS 1-28: Wind Design.
      - 2) Data Sheet FM DS 1-29: Roof Deck Securement and Above-Deck Roof Components.
      - 3) Data Sheet FM DS 1-49: Perimeter Flashing.
  - 2. Minimum Insulation Requirements: Excluding tapered insulation.
    - a. Minimum Layers of Insulation: Two.
    - b. Minimum Overall Thickness: 6 inches.
    - c. Minimum R-value: 30.
  - 3. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials as demonstrated by roof membrane manufacturer based on testing and field experience.

## 2.03 ROOF MEMBRANE

- A. Membrane: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrim.
  - 1. Thickness: 60 mil, 0.060 inch, nominal.
  - 2. Color: Selected by Architect from standard range.

## 2.04 COVER BOARD

- A. Faced Polyisocyanurate Cover Board: High compressive strength board, conforming to ASTM C1289, Type II, Class 4 - Faced with coated or uncoated polymer-bonded glass fiber mat facers on both major surfaces of the core foam.
  - 1. Grade and Compressive Strength: Grade 1, 80 psi.
  - 2. Board Size: 4 by 4, or 4 by 8 feet.
  - 3. Board Thickness: 1/2 inch.
  - 4. Insulation Thermal Resistance, R-value: 2.5, nominal.
  - 5. Products:
    - a. Carlisle SynTec Systems; SecurShield HD Plus: [www.carlisesyntec.com](http://www.carlisesyntec.com).
    - b. Firestone Building Products; ISOGARD HD Cover Board: [www.firestonebpco.com](http://www.firestonebpco.com).
    - c. Johns Manville; Invinsa Roof Board: [www.jm.com](http://www.jm.com).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

- J. Vapor Barrier Primer: As recommended by vapor barrier manufacturer.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailing strips are in place.

#### **3.02 INSTALLATION - GENERAL**

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

#### **3.03 INSULATION INSTALLATION**

- A. Ensure vapor barrier is clean and dry, continuous, and ready for application of insulation.
- B. Attachment of Insulation: Includes tapered insulation.
  - 1. Mechanically fasten first layer of insulation to deck in accordance with roof assembly manufacturer's instructions and FM (AG) Factory Mutual requirements.
  - 2. Embed each subsequent layer of insulation in adhesive in accordance with roof assembly manufacturers' instructions and FM (AG) Factory Mutual requirements.
  - 3. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- C. Cover Boards:
  - 1. Adhere cover board to insulation using adhesive according to roof assembly manufacturer's instructions and FM (AG) Factory Mutual requirements.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- E. On metal deck, place boards perpendicular to flutes with insulation board ends bearing on deck flutes.
- F. Lay boards with edges in tight contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
  - 1. Gaps between boards and adjacent materials shall not exceed 1/4 inch.
- G. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 24 inches.
- H. Do not apply more insulation than can be covered with membrane in same day.

#### **3.04 MEMBRANE INSTALLATION**

- A. Fully adhere membrane roofing system in accordance with manufacturer's recommendations and NRCA (RM) applicable requirements.
- B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- C. Shingle joints on sloped substrate in direction of drainage.

C. Repair or replace defaced or damaged finishes caused by work of this section.

**3.08 PROTECTION**

A. Protect installed roofing and flashings from construction operations.

**END OF SECTION 07 5423**

**SECTION 07 5600 - FLUID-APPLIED ROOFING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fluid-applied roofing materials.
- B. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 7100 - Roof Specialties: Metal Copings, Fascias.
- B. Section 07 7200 - Roof Accessories: Curbs, Roof Hatch

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's data for membrane and accessory materials.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Include standard installation instructions, acceptable installation temperature range, and procedures for unusual perimeter conditions.
- F. Manufacturer's qualification statement.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacture of fluid-applied roofing or waterproofing systems.
  - 1. Three years' documented experience manufacturing type of product specified.
- B. Installer Qualifications: Company specializing in installation of fluid-applied roofing or waterproofing systems.
  - 1. Approved by roofing manufacturer.

**1.05 MOCK-UPS**

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Construct mock-up consisting of at least 100 sq ft of specified roofing materials, including internal and external corners, base flashings, expansion joints, and counterflashings similar to those included as part of this work.
  - 1. Locate where directed.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- C. Store materials in weather protected environment, clear of ground and moisture.
- D. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

**1.07 FIELD CONDITIONS**

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until cured.
- B. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

**1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

- B. Provide five year manufacturer warranty that roofing membrane will not crack, split, or flake under normal weather conditions and will not fail to resist penetration of water during that time period.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Fluid-Applied Roofing:

### **2.02 MATERIALS**

- A. Fluid-Applied Roofing: White, cold-applied; two-component; bio-based, approved by manufacturer for permanent exposure to weather and sunlight.

### **2.03 ACCESSORIES**

- A. Flexible Flashing Sheet: Neoprene or other elastic type sheets approved by roofing membrane manufacturer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions prior to starting this work.
- B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of roofing system.

### **3.02 PREPARATION**

- A. Clean and prepare surfaces to receive roofing in accordance with manufacturer's instructions and recommendations.
  - 1. Power Wash existing roofing surface to remove loose surface debris
- B. Seal cracks and non-moving open joints less than 1/2 inch wide with sealant using methods recommended by roofing and sealant manufacturers; do not seal expansion joints or moving joints of any width.
- C. Install cant strips at inside corners, where indicated and where required by roofing manufacturer.
- D. Protect adjacent surfaces not designated to receive roofing.

### **3.03 INSTALLATION**

- A. Install fluid-applied roofing in accordance with manufacturer's instructions and recommendations, to specified minimum thickness.
- B. Apply roofing materials to surfaces that are acceptable to manufacturer.
- C. Installations Over Sealant-Filled Joints: Install an extra coating of roofing material over joints at least 6 inches on each side of joint.
- D. Penetrations: Unless otherwise indicated on drawings, or recommended by roofing manufacturer, seal flexible flashing sheet around penetrations and to roofing substrate prior to installation of roofing material, embedding flashing sheet in one coat of roofing material.
- E. Embedded Flexible Flashing Sheet: Apply full thickness of roofing material over exposed flashing sheet.
- F. Roof Drains: Unless otherwise recommended by roofing manufacturer, set drain flange in one coating of roofing material and extend a full thickness of roofing material onto drain clamp flange, with adequate coating of roofing material to ensure waterproof seal of clamp ring.
- G. Apply extra thickness of roofing material at corners, intersections, and angles, when recommended by roofing manufacturer.
- H. Walkways: Adhere walkway pads to roofing material using adhesive as recommended by roofing material manufacturer; locate walkways where indicated on drawings or as directed by Architect.

- I. Install counterflashing over exposed edges, where indicated on drawings.

**3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Upon completion of horizontal fluid-applied roofing material installation, install dam at perimeter of installation area in preparation for flood testing.
- C. Flood area to a minimum depth of 1 inch with clean water, and after 72 hours, inspect for leaks.
- D. If leaking is found, remove water, repair leaking areas with new roofing materials as directed by Architect, and repeat flood test. Repair damages to building related to roof test leakage.
- E. When area is confirmed to be watertight, drain water and remove dam materials.

**3.05 PROTECTION**

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must proceed over installed roofing materials, protect surfaces using durable materials acceptable to roofing material manufacturer.

**END OF SECTION 07 5600**

**SECTION 07 7100 - ROOF SPECIALTIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Manufactured roof specialties, including:
  - 1. Copings.
  - 2. Fascia/gravel stops.

**1.02 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.
- C. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2024).
- D. NRCA (RM) - The NRCA Roofing Manual; 2025.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- D. Samples:
  - 1. For each material and finish, submit three samples 4 by 4 inch in size illustrating metal finish color.
  - 2. Provide a full size sample, 12 inches long, for each of the following:
    - a. Copings.
    - b. Roof edges/gravel stops.
    - c. Roof expansion joint cover assemblies.
    - d. Gutters and downspouts.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

**PART 2 PRODUCTS****2.01 COMPONENTS**

- A. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
  - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
  - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
  - 3. Material: Formed aluminum sheet, 0.063 inch thick, minimum.
  - 4. Finish: PVDF coating; 70 percent polyvinylidene fluoride.
  - 5. Color: Two or three coat custom color to match Architect's sample.
  - 6. Products:
    - a. Architectural Products Co.; AP Snap Tight Coping: [www.archprod.com](http://www.archprod.com).
    - b. ATAS International, Inc.; Rapid-Lok Coping: [www.atas.com](http://www.atas.com).
    - c. Carlisle SynTec Systems; SecureEdge 200 Coping: [www.carlisesyntec.com](http://www.carlisesyntec.com).
    - d. Firestone Building Products; Firestone Gold Coping: [www.firestonebpco.com](http://www.firestonebpco.com).
    - e. Johns Manville; Presto Lock Coping System: [www.jm.com](http://www.jm.com).
    - f. Metal-Era; Perma-Tite Coping: [www.metalera.com](http://www.metalera.com).

- g. OMG Roofing Products; PermaSnap: [www.omgroofing.com](http://www.omgroofing.com).
  - h. Petersen Aluminum Corp.; PAC-TITE Coping: [www.pac-clad.com](http://www.pac-clad.com).
  - i. Sika Sarnafil; Wall Grip Coping: [usa.sarnafil.sika.com](http://usa.sarnafil.sika.com).
  - j. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fascia/Gravel Stop: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
- 1. Configuration: Fascia, cant, and edge securement for roof membrane.
  - 2. Accessories:
    - a. Fascia extenders with continuous hold-down cleats.
      - 1) Depth: As indicated on Drawings.
  - 3. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
  - 4. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
  - 5. Finish: PVDF coating; 70 percent polyvinylidene fluoride.
  - 6. Color: Two or three coat custom color to match Architect's sample.
  - 7. Products:
    - a. Architectural Products Co.; AP Snap-On Fascia: [www.archprod.com](http://www.archprod.com).
    - b. ATAS International, Inc.; Edge-Lok 2: [www.atas.com](http://www.atas.com).
    - c. Carlisle SynTec Systems; SecureEdge 200 Fascia: [www.carlisesyntec.com](http://www.carlisesyntec.com).
    - d. Firestone Building Products; Firestone EdgeGard - Snap-On: [www.firestonebpco.com](http://www.firestonebpco.com).
    - e. Johns Manville; Presto-Tite Edge One Fascia System: [www.jm.com](http://www.jm.com).
    - f. Metal-Era; Perma-Tite System 200 Fascia: [www.metalera.com](http://www.metalera.com).
    - g. OMG Roofing Products; EconoSnap Fascia System: [www.omgroofing.com](http://www.omgroofing.com).
    - h. Petersen Aluminum Corp.; PAC Snap Edge Fascia: [www.pac-clad.com](http://www.pac-clad.com).
    - i. Sika Sarnafil; Edge Grip Fascia: [usa.sarnafil.sika.com](http://usa.sarnafil.sika.com).
    - j. Substitutions: See Section 01 6000 - Product Requirements.

## 2.02 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system. Two or three-coat system, unless otherwise indicated.

## 2.03 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.
- C. Roof Cement: ASTM D4586/D4586M, Type I.
- D. Protective Backing Paint: Zinc molybdate alkyd.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

### 3.02 PREPARATION

- A. To prevent galvanic action or corrosion, back paint concealed metal surfaces with protective backing paint, minimum dry film thickness of 3 mil, or provide other permanent separation as recommended by unit manufacturer, where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates.

### 3.03 INSTALLATION - GENERAL

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

**3.04 CLEANING**

- A. On completion of manufactured roof specialties installations, remove unused materials and clean finished surfaces as recommended by roof specialties manufacturers. Maintain finishes in clean condition.
- B. Replace manufactured roof specialties damaged or deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 07 7100**

**SECTION 07 7200 - ROOF ACCESSORIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Roof curbs.
- B. Roof hatches.

**1.02 REFERENCE STANDARDS**

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
  - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
- D. Samples:
  - 1. For each material and finish, submit three samples 4 by 4 inch in size illustrating metal finish color.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

**PART 2 PRODUCTS****2.01 ROOF CURBS**

- A. Manufacturers:
  - 1. The Pate Company: [www.patecurbs.com](http://www.patecurbs.com).
  - 2. LMCurbs: [www.lmcurbs.com](http://www.lmcurbs.com).
  - 3. Roof Products & Systems (RPS), Hart & Cooley Inc.: [www.rpscurebs.com](http://www.rpscurebs.com).
  - 4. Thybar Corporation: [www.thybar.com](http://www.thybar.com).
  - 5. Vent Products Company, Inc.: [www.ventproducts.com](http://www.ventproducts.com).
  - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Roof Curbs: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
  - 1. Roof Curb Mounting Substrate: Curb substrate consists of corrugated metal roof deck with insulation.
  - 2. Sheet Metal Material:
    - a. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G90 coating designation; 18 gage, 0.048 inch thick, minimum.
      - 1) Finish: Factory primed.
  - 3. Nailer: Provide preservative treated wood nailers along top of rails.
  - 4. Insulation: Factory insulated with 1-1/2 inch thick glass-fiber board insulation; 3 lb density.
  - 5. Liner: Same material as curb, of manufacturer's standard thickness and finish.
  - 6. Height Above Finished Roof Surface: 12 inches, minimum.
  - 7. Provide layouts and configurations indicated on drawings.

**2.02 ROOF HATCHES**

- A. Roof Hatch Manufacturers:

1. Activar Construction Products Group, Inc. - JL Industries: [www.activarcpg.com](http://www.activarcpg.com).
  2. Acudor Products Inc: [www.acudor.com](http://www.acudor.com).
  3. Babcock-Davis: [www.babcockdavis.com](http://www.babcockdavis.com).
  4. Bilco Company: [www.bilco.com](http://www.bilco.com).
  5. Milcor, Inc., Hart & Cooley Inc.: [www.milcorinc.com](http://www.milcorinc.com).
  6. Nystrom, Inc: [www.nystrom.com](http://www.nystrom.com).
  7. The Pate Company; [www.patecurbs.com](http://www.patecurbs.com)
  8. Substitutions: See Section 01 6000 - Product Requirements.
- B. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
1. Type: Single-leaf lid.
  2. Size: 36 by 36 inches.
  3. Roof Hatch Mounting Substrate: Substrate consists of corrugated metal roof deck with insulation.
  4. Performance Requirements:
    - a. Loads:
      - 1) External Live Load: 40 psf, minimum.
      - 2) Wind Uplift: 20 psf.
    - b. Lid operation shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
      - 1) Operation shall not be affected by temperature.
    - c. Entire hatch assembly shall be weather tight.
  5. Sheet Metal Material: For lid and curb.
    - a. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G90 coating designation; 14 gage, 0.0747 inch thick, minimum.
      - 1) Finish: Powder coat.
      - 2) Color: As selected by Architect from manufacturer's standard line of colors.
  6. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
  7. Liners for Lid and Curb: Same material as curb, of manufacturer's standard thickness and finish.
  8. Curb Height: 12 inches from surface of roof deck, minimum.
  9. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
    - a. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
    - b. Hinges: Heavy duty pintle type.
    - c. Hold open arm with vinyl-coated handle for manual release.
    - d. Latch: Upon closing, engage latch automatically and reset manual release.
    - e. Manual Release: Pull handle on interior and exterior.
    - f. Locking: Padlock hasp on interior.
  10. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
    - a. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
    - b. Height: 42 inches above finished roof deck.
    - c. Material: Steel tube.
    - d. Finish: Manufacturer's standard baked enamel or powder coat.
    - e. Color: Yellow.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

**3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.
- B. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
- C. Roof-Hatch Installation:
  - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
  - 2. Attach ladder-assist post according to manufacturer's instructions.

**3.04 CLEANING**

- A. Clean installed work to like-new condition.

**3.05 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION 07 7200**

**SECTION 07 9200 - JOINT SEALANTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Nonsag gunnable joint sealants.
- B. Joint backings and accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
- B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).
- C. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.
- I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2025).
- J. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
  - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
  - 2. List of backing materials approved for use with the specific product.
  - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
  - 4. Substrates the product should not be used on.
  - 5. Substrates for which use of primer is required.
  - 6. Sample product warranty.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where custom colors are not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: For each sealant color, submit at least three physical samples for color verification.
  - 1. Provide 1/2 inch wide joint sealant samples formed between two 4 inch long strips of material matching appearance of exposed surfaces adjacent to joint sealants.
- F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- G. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

- H. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least 5 years of documented experience.
- C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
  - 1. Adhesion Testing: In accordance with ASTM C794.
  - 2. Compatibility Testing: In accordance with ASTM C1087.
  - 3. Stain Testing: In accordance with ASTM C1248; required only for stone substrates.
  - 4. Allow sufficient time for testing to avoid delaying the work.
  - 5. Deliver to manufacturer sufficient samples for testing.
  - 6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
  - 7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- D. Owner may employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.
  - 1. Contractor shall cooperate with testing agency and repair failures discovered.
  - 2. Otherwise, if Owner does not employ an independent testing agency, Contractor shall perform its own field quality control measures including the following:
    - a. Field Quality Control Plan and Log.
    - b. Field Adhesion Test Procedures.
- E. Field Quality Control Plan:
  - 1. Visual inspection of entire length of sealant joints.
  - 2. Non-destructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
    - a. For each different sealant and substrate combination, allow for one test every 12 inches in the first 10 linear feet of joint and one test every 120 inches thereafter.
    - b. If any failures occur in the first 10 linear feet, continue testing at 48 inch intervals at no extra cost to Owner.
- F. Field Adhesion Test Procedures:
  - 1. Allow sealants to fully cure as recommended by manufacturer before testing.
  - 2. Have a copy of the test method document available during tests.
  - 3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
  - 4. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
  - 5. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.
    - a. Record results on Field Quality Control Log.
    - b. Repair failed portions of joints.

#### **1.05 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.

- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

## **PART 2 PRODUCTS**

### **2.01 JOINT SEALANT APPLICATIONS**

- A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
    - a. Joints between different exposed materials.
    - b. Openings below ledge angles in masonry.
    - c. Other joints as indicated.
  2. Do not seal the following types of joints.
    - a. Intentional weepholes in masonry.
    - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
    - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
    - d. Joints where installation of sealant is specified in another section.
    - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

### **2.02 NONSAG JOINT SEALANTS**

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Type S, Uses NT, A, G, M and O; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
  2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
  3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
  4. Hardness Range: Comply with one of the following:
    - a. 15 to 35, Shore A, when tested in accordance with ASTM C661.
    - b. 25 to 35, Shore A, when tested in accordance with ASTM D2240.
  5. Color: Custom color(s) to match Architect's sample(s).
  6. Cure Type: Single-component, neutral moisture curing.
  7. Service Temperature Range: Minus 40 to 250 degrees F.
  8. Products:
    - a. Momentive Performance Materials, Inc./GE; SCS9000 SilPruf NB: [www.siliconeforbuilding.com](http://www.siliconeforbuilding.com).
    - b. Pecora Corporation; 890NST: [www.pecora.com](http://www.pecora.com).
    - c. Sika Corporation; Sikasil WS-295 FPS: [www.usa.sika.com](http://www.usa.sika.com).
    - d. Tremco, Inc.; Spectrem 3: [www.tremcosealants.com](http://www.tremcosealants.com).
    - e. Dow Chemical Company; DOWSIL 790 Silicone Building Sealant: [consumer.dow.com/en-us/industry/ind-building-construction.html/#sle](http://consumer.dow.com/en-us/industry/ind-building-construction.html/#sle).
    - f. Substitutions: See Section 01 6000 - Product Requirements.
- B. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use. Siliconized.
1. Color: To be selected by Architect from manufacturer's full range.
  2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).
  3. Products:
    - a. Franklin International Inc; Titebond Painter's Plus Caulk: [www.titebond.com](http://www.titebond.com).
    - b. Pecora Corporation; AC-20 +Silicone: [www.pecora.com](http://www.pecora.com).
    - c. Sherwin Williams; 950A Siliconized Acrylic Latex Caulk: [www.sherwin-williams.com](http://www.sherwin-williams.com).
    - d. Tremco, Inc.; Tremflex 834: [www.tremcosealants.com](http://www.tremcosealants.com).
    - e. Substitutions: See Section 01 6000 - Product Requirements.

**2.03 ACCESSORIES**

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
  - 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
  - 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
  - 3. Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

**3.02 PREPARATION**

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

**3.03 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.
- I. Installation of Two-Stage Joints at Precast Architectural Concrete Units:
  - 1. Joint system consists of two back-to-back sealant joints at each precast architectural concrete unit joint with a weep at the bottom of the unit joint per Precast/Prestressed Concrete Institute (PCI) recommendations and as follows:

- a. Inner (Secondary) Seal: Inner secondary backer rod and sealant joint is installed a minimum of 2 to 2-1/2 inches beyond the exposed face of the precast architectural concrete panels within the panel joint itself.
- b. Exterior (Primary) Seal: Following the installation of the secondary joint, the outer primary backer rod and sealant joint is installed at the face of the precast architectural concrete panels with a weep at the bottom of the joint. Leave open continuous air space between the primary backer rod and inner secondary seal.
- c. Install 3/8 inch minimum weep openings in the exterior seal to allow water penetrating the exterior seal and contained by the inner seal to exit the cavity between joint seals.
  - 1) Do not install weeps below finish grades.
- d. Near the junction of horizontal and vertical joints, the inner seal must turn out to the plane of the exterior seal at regular intervals to force water out of the joint.

#### **3.04 FIELD QUALITY CONTROL**

- A. Owner may employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

**END OF SECTION 07 9200**

**SECTION 26 0010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section specifies supplemental requirements generally applicable to the Work specified in Division 26. This Section is also referenced by related Work specified in other Divisions.

**1.2 REFERENCES**

- A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:
1. A: Ampere, unit of electrical current.
  2. AC or ac: Alternating current.
  3. AFCI: Arc-fault circuit interrupter.
  4. AIC: Ampere interrupting capacity.
  5. AL, Al, or ALUM: Aluminum.
  6. ASD: Adjustable-speed drive; also called "variable-frequency drive" (VFD).
  7. ATS: Automatic transfer switch.
  8. AWG: American wire gauge; see ASTM B258.
  9. BAS: Building automation system.
  10. BIL: Basic impulse insulation level.
  11. BIM: Building information modeling.
  12. CAD: Computer-aided design or drafting.
  13. CATV: Community antenna television.
  14. CB: Circuit breaker.
  15. CO/ALR: Copper-aluminum, revised.
  16. COPS: Critical operations power system.
  17. CU or Cu: Copper.
  18. CU-AL or AL-CU: Copper-aluminum.
  19. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
  20. DC or dc: Direct current.
  21. DCOA: Designated critical operations area.
  22. DDC: Direct digital control (HVAC).
  23. EGC: Equipment grounding conductor.
  24. ELV: Extra-low voltage.
  25. EMF: Electromotive force.
  26. EMI: Electromagnetic interference.
  27. EPM: Electrical preventive maintenance.
  28. EPS: Emergency power supply.
  29. EPSS: Emergency power supply system.
  30. ESS: Energy storage system.
  31. EV: Electric vehicle.
  32. EVPE: Electric vehicle power export equipment.
  33. EVSE: Electric vehicle supply equipment.
  34. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
  35. FLC: Full-load current.
  36. ft: Foot.
  37. ft-cd: Foot-candle, the antiquated U.S. Standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" after the SI unit candela (cd) replaced the international candle; see "fc,"
  38. GEC: Grounding electrode conductor.
  39. GFCI: Ground-fault circuit interrupter.
  40. GFPE: Ground-fault protection of equipment.

41. GND: Ground.
42. HACR: Heating, air conditioning, and refrigeration.
43. HDPE: High-density polyethylene.
44. HID: High-intensity discharge.
45. HP or hp: Horsepower.
46. HVAC: Heating, ventilating, and air conditioning.
47. Hz: Hertz.
48. IBT: Intersystem bonding termination.
49. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
50. IP: Ingress protection rating (enclosures); Internet protocol (communications).
51. IR: Infrared.
52. IS: Intrinsically safe.
53. IT&R: Inspecting, testing, and repair.
54. ITE: Information technology equipment.
55. kAIC: Kiloampere interrupting capacity.
56. kcmil or MCM: One thousand circular mils.
57. kV: Kilovolt.
58. kVA: Kilovolt-ampere.
59. kVA<sub>r</sub> or kVAR: Kilovolt-ampere reactive.
60. kW: Kilowatt.
61. kWh: Kilowatt-hour.
62. LAN: Local area network.
63. lb: Pound (weight).
64. lbf: Pound (force).
65. LCD: Liquid-crystal display.
66. LCDI: Leakage-current detector-interrupter.
67. LED: Light-emitting diode.
68. Li-ion: Lithium-ion.
69. lm: Lumen, the SI derived unit of luminous flux.
70. LNG: Liquefied natural gas.
71. LP-Gas: Liquefied petroleum gas.
72. LRC: Locked-rotor current.
73. LV: Low voltage.
74. lx: Lux, the SI derived unit of illuminance equal to one lumen per square meter.
75. m: Meter.
76. MCC: Motor-control center.
77. MDC: Modular data center.
78. MG set: Motor-generator set.
79. MIDI: Musical instrument digital interface.
80. MLO: Main lugs only.
81. MV: Medium voltage.
82. MVA: Megavolt-ampere.
83. mW: Milliwatt.
84. MW: Megawatt.
85. MWh: Megawatt-hour.
86. NC: Normally closed.
87. Ni-Cd: Nickel-cadmium.
88. Ni-MH: Nickel-metal hydride.
89. NIU: Network interface unit.
90. NO: Normally open.
91. NPT: National (American) standard pipe taper.
92. OCPD: Overcurrent protective device.
93. ONT: Optical network terminal.
94. PC: Personal computer.
95. PCS: Power conversion system.
96. PCU: Power-conditioning unit.

97. PF or pf: Power factor.
  98. PHEV: Plug-in hybrid electric vehicle.
  99. PLC: Programmable logic controller.
  100. PLFA: Power-limited fire alarm.
  101. PoE: Power over Ethernet.
  102. PV: Photovoltaic.
  103. PVC: Polyvinyl chloride.
  104. pW: Picowatt.
  105. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
  106. RMS or rms: Root-mean-square.
  107. RPM or rpm: Revolutions per minute.
  108. SCADA: Supervisory control and data acquisition.
  109. SCR: Silicon-controlled rectifier.
  110. SPD: Surge protective device.
  111. sq.: Square.
  112. SWD: Switching duty.
  113. TCP/IP: Transmission control protocol/Internet protocol.
  114. TEFC: Totally enclosed fan-cooled.
  115. TR: Tamper resistant.
  116. TVSS: Transient voltage surge suppressor.
  117. UL: (standards) Underwriters Laboratories, Inc.; (product categories) UL, LLC.
  118. UL CCN: UL Category Control Number.
  119. UPS: Uninterruptible power supply.
  120. USB: Universal serial bus.
  121. UV: Ultraviolet.
  122. V: Volt, unit of electromotive force.
  123. V(ac): Volt, alternating current.
  124. V(dc): Volt, direct current.
  125. VA: Volt-ampere, unit of complex electrical power.
  126. VAR: Volt-ampere reactive, unit of reactive electrical power.
  127. VFC: Variable-frequency controller.
  128. VOM: Volt-ohm-multimeter.
  129. VPN: Virtual private network.
  130. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
  131. W: Watt, unit of real electrical power.
  132. Wh: Watt-hour, unit of electrical energy usage.
  133. WPT: Wireless power transfer.
  134. WPTE: Wireless power transfer equipment.
  135. WR: Weather resistant.
- B. Abbreviations and Acronyms for Electrical Raceway Types:
1. CR: Communications raceway.
  2. CR-GP: General-purpose communications raceway.
  3. CR-P: Plenum communications raceway.
  4. CR-R: Riser communications raceway.
  5. EMT: Electrical metallic tubing.
  6. EMT-A: Aluminum electrical metallic tubing.
  7. EMT-S: Steel electrical metallic tubing.
  8. EMT-SS: Stainless steel electrical metallic tubing.
  9. ENT: Electrical nonmetallic tubing.
  10. EPEC: Electrical HDPE underground conduit (thin wall).
  11. EPEC-A: Type A electrical HDPE underground conduit.
  12. EPEC-B: Type B electrical HDPE underground conduit.
  13. ERMC: Electrical rigid metal conduit.
  14. ERMC-A: Aluminum electrical rigid metal conduit.
  15. ERMC-S: Steel electrical rigid metal conduit.

16. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
  17. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
  18. ERMC-SS: Stainless steel electrical rigid metal conduit.
  19. FMC: Flexible metal conduit.
  20. FMC-A: Aluminum flexible metal conduit.
  21. FMC-S: Steel flexible metal conduit.
  22. FMT: Steel flexible metallic tubing.
  23. FNMC: Flexible nonmetallic conduit. See "LFNC."
  24. HDPE: HDPE underground conduit (thick wall).
  25. HDPE-40: Schedule 40 HDPE underground conduit.
  26. HDPE-80: Schedule 80 HDPE underground conduit.
  27. IMC: Steel electrical intermediate metal conduit.
  28. LFMC: Liquidtight flexible metal conduit.
  29. LFMC-A: Aluminum liquidtight flexible metal conduit.
  30. LFMC-S: Steel liquidtight flexible metal conduit.
  31. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
  32. LFNC: Liquidtight flexible nonmetallic conduit.
  33. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
  34. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
  35. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
  36. OFR: Optical fiber raceway.
  37. OFR-GP: General-purpose optical fiber raceway.
  38. OFR-P: Plenum optical fiber raceway.
  39. OFR-R: Riser optical fiber raceway.
  40. PVC: Rigid PVC conduit.
  41. PVC-40: Schedule 40 rigid PVC conduit.
  42. PVC-80: Schedule 80 rigid PVC Conduit.
  43. PVC-A: Type A rigid PVC concrete-encased conduit.
  44. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
  45. RGS: See ERMC-S-G.
  46. RMC: See ERMC.
  47. RTRC: Reinforced thermosetting resin conduit.
  48. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
  49. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
  50. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
  51. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
  52. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.
- C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:
1. AC: Armored cable.
  2. CATV: Coaxial general-purpose cable.
  3. ITC: Instrumentation tray cable.
  4. ITC-ER: Instrumentation tray cable, exposed run.
  5. MC: Metal-clad cable.
  6. MC-HL: Metal-clad cable, hazardous location.
  7. MI: Mineral-insulated, metal-sheathed cable.
  8. MV: Medium-voltage cable.
  9. NM: Nonmetallic sheathed cable.
  10. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
  11. PV: Photovoltaic cable.
  12. RHW: Thermoset rubber, moisture-resistant cable.
  13. SE: Service-entrance cable.
  14. SER: Service-entrance cable, round.

15. TC: Tray cable.
16. TC-ER: Tray cable, exposed run.
17. TC-ER-HL: Tray cable, exposed run, hazardous location.
18. THW: Thermoplastic, heat- and moisture-resistant cable.
19. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
20. THHW: Thermoplastic, heat- and moisture-resistant cable.
21. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
22. TW: Thermoplastic, moisture-resistant cable.
23. UF: Underground feeder and branch-circuit cable.
24. USE: Underground service-entrance cable.
25. XHH: Cross-linked polyethylene, heat-resistant cable.
26. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Definitions:

1. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
2. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
3. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
4. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
5. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
6. Designated Seismic System: A system component that requires design in accordance with Ch. 13 of ASCE/SEI 7 and for which the Component Importance Factor is greater than 1.0.
7. Direct Buried: Installed underground without encasement in concrete or other protective material.
8. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
  - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
  - b. Concrete Box: A box intended for use in poured concrete.
  - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
  - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
  - e. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
  - f. Device Box: A box with provisions for mounting a wiring device directly to the box.
  - g. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.

- h. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
  - i. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
  - j. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
  - k. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
  - l. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
  - m. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
  - n. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
  - o. Raised-Floor Box: A floor box intended for use in raised floors.
  - p. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
  - q. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
  - r. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
  - s. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
  - t. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
9. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
10. Essential Electrical Systems: (healthcare facilities) Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system.
11. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
- a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
12. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.

13. Jacket: A continuous nonmetallic outer covering for conductors or cables.
14. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
15. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
16. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
17. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
18. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
19. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
20. Sheath: A continuous metallic covering for conductors or cables.
21. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
22. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
  - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
  - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
  - c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
  - d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
  - e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
  - f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.
23. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

### 1.3 COORDINATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
  1. Notify Owner no fewer than seven days in advance of proposed interruption of electrical service.
  2. Do not proceed with interruption of electrical service without Owner's written permission.

### 1.4 SEQUENCING

- A. Conduct and submit results of power system studies before submitting Product Data and Shop Drawings for electrical equipment.

### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

B. Software and firmware operational documentation.

C. Software.

**PART 2 - PRODUCTS**

**PART 3 - EXECUTION**

**3.1 PREPARATION**

A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect including, but not limited to, milestone dates for the following activities:

1. Submission of action submittals specified in Division 26.
2. Mockup reviews where required.
3. Closing of walls and ceilings containing electrical Work.
4. Requests for special inspections.
5. Requests for inspections by authorities having jurisdiction.

**3.2 DEMOLITION**

A. Where electrical devices are to be removed, remove all associated conduit and wire back to the source unless noted otherwise.

B. Where recessed electrical devices are removed from a block or concrete wall, provide blank stainless steel cover plate unless noted otherwise. Patch and paint wall as required to return condition of the wall to its original condition. Where devices are removed from a stud and gypsum board wall, remove the device associated box, conduit and wire back to source. Provide drywall patch and paint to match.

C. Patch, repair, and paint any openings through roof, ceilings, walls or floors to match its original condition. Maintain all fire ratings of walls and floors.

**3.3 INSTALLATION OF ELECTRICAL WORK**

A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

**3.4 CLOSEOUT ACTIVITIES**

A. Operation and Maintenance Data: Prepare and submit the following:

1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device.
2. Include the following information:
  - a. Manufacturer's operating specifications.
  - b. User's guides for software and hardware.
  - c. Schedule of maintenance material items recommended to be stored at Project site.
  - d. Detailed instructions covering operation under both normal and abnormal conditions.
  - e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
  - f. List of load-current and overload-relay heaters with related motor nameplate data.
  - g. List of lamp types and photoelectric relays used on Project, with ANSI and manufacturers' codes.
  - h. Manufacturer's instructions for setting field-adjustable components.
  - i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
  - j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
  - k. Exterior pole inspection and repair procedures.
  - l. Include copies of demonstration and training videos.

B. Software and Firmware Operational Documentation: Provide software and firmware operational documentation, including the following:

1. Software operating and upgrade manuals.
2. Names, versions, and website addresses for locations of installed software.
3. Device address list.
4. Printout of software application and graphic screens.

5. Testing and adjusting of panic and emergency power features.
6. For lighting controls, include the following:
  - a. Adjustments of scene preset controls, adjustable fade rates, and fade overrides.
  - b. Operation of adjustable zone controls.

**END OF SECTION 26 0010**



**SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Copper building wire.
  - 2. Metal-clad cable, Type MC.
  - 3. Connectors and splices.
- B. Related Requirements:
  - 1. Section 26 0010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
  - 2. Section 26 0523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

**1.2 ACTION SUBMITTALS**

- A. Product Data:
  - 1. Copper building wire.
  - 2. Metal-clad cable, Type MC.
  - 3. Connectors and splices.
- B. Product Schedule: Indicate type, use, location, and termination locations.

**PART 2 - PRODUCTS****2.1 COPPER BUILDING WIRE**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alpha Wire; brand of Belden, Inc.
  - 2. Belden Inc.
  - 3. Cerro Wire LLC
  - 4. Encore Wire Corporation
  - 5. General Cable; Prysmian Group North America
  - 6. Okonite Company (The)
  - 7. Service Wire Co.
  - 8. Southwire Company, LLC
  - 9. WESCO
- B. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B496 for stranded conductors.
- E. Conductor Insulation:
  - 1. Type RHH and Type RHW-2. Comply with UL 44.
  - 2. Type THHN. Comply with UL 83.
  - 3. Type UF. Comply with UL 83 and UL 493.
  - 4. Type XHHW-2. Comply with UL 44.

**2.2 METAL-CLAD CABLE, TYPE MC**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems; Atkore International
  - 2. Alpha Wire; brand of Belden, Inc.
  - 3. Belden Inc.
  - 4. Encore Wire Corporation
  - 5. General Cable; Prysmian Group North America

- 6. Okonite Company (The)
- 7. Southwire Company, LLC
- 8. WESCO
- 9.
- B. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. Comply with UL 1569.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Ground Conductor: Insulated.
- F. Conductor Insulation:
  - 1. Type TFN/THHN/THWN-2. Comply with UL 83.
  - 2. Type XHHW-2. Comply with UL 44.
- G. Armor: Steel, interlocked.
- H. Jacket: PVC applied over armor.

### 2.3 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. 3M Electrical Products
  - 2. ABB, Electrification Business
  - 3. AFC Cable Systems; Atkore International
  - 4. Gardner Bender
  - 5. Hubbell Utility Solutions; Hubbell Incorporated
  - 6. Ideal Industries, Inc.
  - 7. ILSCO
  - 8. NSi Industries LLC
  - 9. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group
  - 10. Service Wire Co.
  - 11. TE Connectivity Ltd.
- B. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  - 1. Material: Copper.
  - 2. Type: Two hole with standard barrels.
  - 3. Termination: Compression.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
  - 1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
  - 2. Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors must be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
  - 1. Copper:
    - a. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
    - b. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- C. ASD Output Circuits Cable: Extra-flexible stranded for all sizes.

- D. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.
- 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**
- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- H. Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.
- I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless steel, wire-mesh, strain relief device at terminations to suit application.
- 3.3 INSTALLATION, GENERAL**
- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points in accordance with Section 26 0533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."
- G. Complete cable tray systems installation according to Section 26 0536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.
- 3.4 CONNECTIONS**
- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inch of slack.
- D. Comply with requirements in Section 28 4621.11 "Addressable Fire-Alarm Systems" for connecting, terminating, and identifying wires and cables.
- 3.5 IDENTIFICATION**
- A. Identify and color-code conductors and cables according to Section 26 0553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.
- 3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS**
- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

**3.7 FIRESTOPPING**

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 8413 "Penetration Firestopping."

**3.8 FIELD QUALITY CONTROL**

- A. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors feeding the following critical equipment and services for compliance with requirements:

a.

3. Perform each of the following visual and electrical tests:

a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.

b. Test bolted connections for high resistance using one of the following:

- 1) A low-resistance ohmmeter.
- 2) Calibrated torque wrench.
- 3) Thermographic survey.

c. Inspect compression-applied connectors for correct cable match and indentation.

d. Inspect for correct identification.

e. Inspect cable jacket and condition.

f. Insulation-resistance test on each conductor for ground and adjacent conductors.

Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.

g. Continuity test on each conductor and cable.

h. Uniform resistance of parallel conductors.

- B. Cables will be considered defective if they do not pass tests and inspections.

- C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

**END OF SECTION 26 0519**

**SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Grounding and bonding conductors.
  - 2. Grounding and bonding clamps.
  - 3. Grounding and bonding bushings.
  - 4. Grounding and bonding hubs.
  - 5. Grounding and bonding connectors.
  - 6. Intersystem bonding bridge grounding connector.
  - 7. Grounding and bonding busbars.
  - 8. Signal reference grids.
  - 9. Grounding electrode enclosures.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Field quality-control reports.

**PART 2 - PRODUCTS****2.1 GROUNDING AND BONDING CONDUCTORS**

- A. Equipment Grounding Conductor:
  - 1. General Characteristics: 600 V, THHN/THWN-2, tinned-copper wire or cable, green color, in accordance with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
- B. ASTM - Bare Copper Grounding and Bonding Conductor:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ERICO; brand of nVent Electrical plc
    - b. Harger Lightning & Grounding; business of Harger, Inc.
  - 2. Referenced Standards: Complying with one or more of the following:
    - a. Soft or Annealed Copper Wire: ASTM B3.
    - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
    - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
    - d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

**2.2 GROUNDING AND BONDING CLAMPS**

- A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.
- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
    - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
- D. UL KDER and KDSH - Strap-Type Pipe and Rod Grounding and Bonding Clamp:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated
- b. Crouse-Hinds; brand of Eaton, Electrical Sector
- c. ERICO; brand of nVent Electrical plc
- d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group
- e. Panduit Corp
- 2. General Characteristics:
  - a. Clamp Material: Tinned copper.
  - b. Listed for outdoor use.
- E. UL KDER - Beam Grounding and Bonding Clamp:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. Anderson; brand of Hubbell Utility Solutions; Hubbell Incorporated
    - c. Panduit Corp
    - d. Penn-Union Corp.; subsidiary of Nesco, Inc.
  - 2. General Characteristics: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.
- F. UL KDER - Exothermically Welded Connection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. ALLTEC LLC
    - c. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated
    - d. Crouse-Hinds; brand of Eaton, Electrical Sector
    - e. ERICO; brand of nVent Electrical plc
    - f. Harger Lightning & Grounding; business of Harger, Inc.
  - 2. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

**2.3 GROUNDING AND BONDING BUSHINGS**

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.
- B. Source Limitations: Obtain products from single manufacturer.
- C. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- D. UL KDER - Bonding Bushing:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. Arlington Industries, Inc.
    - c. Crouse-Hinds; brand of Eaton, Electrical Sector
    - d. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated

- e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group
- f. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated
- 2. General Characteristics: Threaded bushing with insulated throat.
- E. UL KDER - Grounding Bushing:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. Arlington Industries, Inc.
    - c. Crouse-Hinds; brand of Eaton, Electrical Sector
    - d. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated
    - e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group
    - f. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated
  - 2. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

#### 2.4 **GROUNDING AND BONDING CONNECTORS**

- A. Source Limitations: Obtain products from single manufacturer.
- B. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
    - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
- C. UL KDER - Pressure-Type Grounding and Bonding Busbar Cable Connector:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated
  - 2. General Characteristics: Copper or copper alloy, for compression bonding of one or more conductor directly to copper busbar. Listed for direct burial.
- D. UL KDER - Lay-In Lug Mechanical-Type Grounding and Bonding Busbar Terminal:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. Chatsworth Products, Inc.
    - c. Greaves Corp.; Essex Products Group, Inc.
    - d. ILSCO
  - 2. General Characteristics: Mechanical-type, copper rated for direct burial terminal with set screw.
- E. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. Harger Lightning & Grounding; business of Harger, Inc.
    - c. ILSCO

2. General Characteristics: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on **5/8 or 1 inch** centers for two-bolt connection to busbar.
- F. UL KDER - Split-Bolt Service-Post Pressure-Type Grounding and Bonding Busbar Terminal:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Panduit Corp
  2. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened after assembly is screwed into busbar opening.
- G. UL KDER - Crimped Pressure-Type Grounding and Bonding Cable Connector:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. ABB, Electrification Business: Unknown Product Name
  2. General Characteristics: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.
    - a. Tinned copper, C and H shaped.
- H. UL KDER - Split-Bolt Pressure-Type Grounding and Bonding Cable Connector:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. allG Fabrication (formerly ALT)
    - c. ERICO; brand of nVent Electrical plc
    - d. Greaves Corp.; Essex Products Group, Inc.
  2. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened.
    - a. Tinned copper.
- I. UL KDER - Signal Reference Grid Grounding and Bonding Connector:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated
    - c. Cooper B-line; brand of Eaton, Electrical Sector
    - d. ERICO; brand of nVent Electrical plc
    - e. Harger Lightning & Grounding; business of Harger, Inc.
  2. General Characteristics: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of electrical service equipment connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

**3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS**

- A. Grounding and Bonding Conductors:
1. Provide solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
  2. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
  3. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, **1/4 inch** in diameter.
  4. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
  5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; **1-5/8 inch** wide and **1/16 inch** thick.
  6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; **1-5/8 inch** wide and **1/16 inch** thick.
  7. Underground Grounding Conductors: Install bare tinned-copper conductor, 2/0 AWG minimum.
- B. Grounding and Bonding Connectors:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  3. Connections to Ground Rods at Test Wells: Bolted connectors.
  4. Connections to Structural Steel: Welded connectors.
- C. Grounding and Bonding Busbars: Provide in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated on Drawings.
- D. Substation Signal Reference Grid:
1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with IEEE C2.
    - a. Install 6 AWG bonding conductors below grade in a grid pattern on **2 ft** centers. Bond grid conductors with exothermic welds where they cross each other.
    - b. Grid must fill entire area inside equipment yard fence, and extend minimum **6.5 ft** outside fence, so someone walking or running outside yard may not touch fence or open gate without first stepping inside grid.
    - c. Bond each metal fence post and gate post to at least two grid conductors.
    - d. Inside grid, bond equipment reinforcing steel inside bases and sidewalks to at least two grid conductors.
    - e. Bond underground metal pipe and conduit passing under grid to nearest grid conductor at both ends.
- E. Signal Reference Grid Tape Mesh:
1. Install tape mesh under floor finish with the following features:
    - a. Tape mesh, **2 inch** by **16 mil** solid copper, 24 inch spacing.

**3.3 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR COMMUNICATIONS**

- A. Comply with Section 27 0528 "Pathways for Communications Systems" and Section 27 1100 "Communications Equipment Room Fittings."

**3.4 INSTALLATION OF GROUNDING AND BONDING**

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
1. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
  2. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:
1. Grounding and Bonding Conductors:

- a. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
  - b. Underground Grounding Conductors:
    - 1) Bury at least **30 inch** below grade.
    - 2) Duct-Bank Grounding Conductor: Bury **12 inch** above duct bank when indicated as part of duct-bank installation.
2. Grounding and Bonding Connectors: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
- a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - b. Make connections with clean, bare metal at points of contact.
  - c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
  - d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
  - e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
  - f. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
    - 1) Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate adjacent parts.
    - 2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
    - 3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.
  - g. Grounding and Bonding for Piping:
    - 1) Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
    - 2) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with bolted connector.
    - 3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
  - h. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
  - i. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than **60 ft** apart.
3. Grounding and Bonding Busbars:
- a. Install busbar horizontally, on insulated spacers **2 inch** minimum from wall, **6 inch** above finished floor unless otherwise indicated.

- b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.
4. Grounding at Service:
- a. Equipment grounding conductors and grounding electrode conductors must be connected to ground busbar. Install main bonding jumper between neutral and ground buses.
5. Grounding Separately Derived Systems:
- a. Permanent Generators: Install grounding electrode(s) at location of permanent generators having switched neutral connections. Electrode must be connected to equipment grounding conductor and to frame of generator.
6. Grounding Underground Distribution System Components:
- a. Duct-Bank Grounding Conductor: Bury **12 inch** above duct bank when indicated as part of duct-bank installation.
  - b. Comply with IEEE C2 grounding requirements.
  - c. Grounding Manholes and Handholes: Install driven ground rod through manhole or handhole floor, close to wall, and set rod depth so **4 inch** will extend above finished floor. If necessary, install ground rod before manhole is placed and provide 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from **2 inch** above to **6 inch** below concrete. Seal floor opening with waterproof, nonshrink grout.
  - d. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields in accordance with manufacturer's published instructions with splicing and termination kits.
  - e. Pad-Mounted Transformers and Switches: Install two ground rods and ring electrode around pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than 2 AWG for ring electrode and for taps to equipment grounding terminals. Bury ring electrode not less than **6 inch** from foundation.
7. Equipment Grounding and Bonding:
- a. Install insulated equipment grounding conductors with feeders and branch circuits.
  - b. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
    - 1) Feeders and branch circuits.
    - 2) Lighting circuits.
    - 3) Receptacle circuits.
    - 4) Single-phase motor and appliance branch circuits.
    - 5) Three-phase motor and appliance branch circuits.
    - 6) Flexible raceway runs.
    - 7) Armored and metal-clad cable runs.
  - c. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air

cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

- d. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- e. Poles Supporting Outdoor Lighting Fixtures: Bond insulated equipment grounding conductor to equipment grounding terminal inside pole base.

### 3.5 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING

#### A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at individual ground rods. Make tests at ground rods before conductors are connected.
  - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
  - b. Perform tests by fall-of-potential method in accordance with IEEE Std 81.
  - c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to record of tests and observations. Include number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

#### B. Nonconforming Work:

1. Grounding system will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective components and retest.

#### C. Collect, assemble, and submit test and inspection reports.

1. Report measured ground resistances that exceed the following values:
  - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10  $\Omega$ .
  - b. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5  $\Omega$ .
  - c. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3  $\Omega$ .
  - d. Power Distribution Units or Panelboards Serving Electronic Equipment: 1  $\Omega$ .
  - e. Substations and Pad-Mounted Equipment: 5  $\Omega$ .
  - f. Manhole Grounds: 10  $\Omega$ .

### 3.6 PROTECTION

- A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

**END OF SECTION 26 0526**

**SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Support, anchorage, and attachment components.
  - 2. Fabricated metal equipment support assemblies.

**PART 2 - PRODUCTS****2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D635.

**2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum **13/32 inch** diameter holes at a maximum of **8 inch** on center in at least one surface.
  - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 2. Material for Channel, Fittings, and Accessories: Galvanized steel.
  - 3. Channel Width: Selected for applicable load criteria.
  - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 5. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, **Grade A325**.
  - 6. Toggle Bolts: Stainless steel springhead type.
  - 7. Hanger Rods: Threaded steel.

**2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES**

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 05 5000 "Metal Fabrications" for steel shapes and plates.

**PART 3 - EXECUTION****3.1 SELECTION**

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  - 1. NECA NEIS 101
  - 2. NECA NEIS 105.
- B. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways specified in Section 26 0533.13 "Conduits for Electrical Systems."
- D. Comply with requirements for boxes specified in Section 26 0533.16 "Boxes and Covers for Electrical Systems."
- E. Provide vibration and seismic controls with hangers and supports in accordance with requirements specified in "Section 26 0548 "Vibration and Seismic Controls for Electrical Systems." "Section 26 0548.16 "Seismic Controls for Electrical Systems."
- F. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as scheduled in NECA NEIS 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size must be **1/4 inch** in diameter.
- G. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.
- H. Spring-steel clamps designed for supporting single conduits without bolts may be used for **1-1/2 inch** and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

**3.2 INSTALLATION OF SUPPORTS**

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT may be supported by openings through structure members, in accordance with NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus **200 lb**.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete **4 inch** thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than **4 inch** thick.
  - 6. To Steel: Spring-tension clamps.
  - 7. To Light Steel: Sheet metal screws.
  - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

**3.3 INSTALLATION OF FABRICATED METAL SUPPORTS**

- A. Comply with installation requirements in Section 05 5000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M. Submit welding certificates.

**3.4 CONCRETE BASES**

- A. Construct concrete bases of dimensions indicated, but not less than **4 inch** larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000 psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 3000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

**3.5 PAINTING**

- A. Touchup:
  - 1. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
    - a. Apply paint by brush or spray to provide minimum dry film thickness of **2.0 mils**.
  - 2. Comply with requirements in Section 09 9113 "Exterior Painting" Section 09 9123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

**END OF SECTION 26 0529**



**SECTION 26 0533.13 - CONDUITS FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Type EMT-S duct raceways and elbows.
  - 2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
  - 3. Type PVC duct raceways and fittings.
  - 4. Fittings for conduit, tubing, and cable.
  - 5. Electrically conductive corrosion-resistant compounds for threaded conduit.
  - 6. Solvent cements.
- B. Related Requirements:
  - 1. Section 26 0010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
  - 2. Section 26 0519 "Low-Voltage for Electrical Power Conductors and Cables" for nonmetallic underground conduit with conductors (Type NUCC).
  - 3. Section 26 0543 "Underground Ducts and Raceways for Electrical Systems" for exterior duct banks, manholes, and underground utility construction.

**1.2 DEFINITIONS**

- A. Conduit: A structure containing one or more duct raceways.
- B. Duct Raceway: A single enclosed raceway for conductors or cable.
- C. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.

**1.3 ACTION SUBMITTALS**

- A. Product Data:
  - 1. Type EMT-S duct raceways and elbows.
  - 2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
  - 3. Type LFMC duct raceways.
  - 4. Type PVC duct raceways and fittings.

**PART 2 - PRODUCTS****2.1 TYPE EMT-S DUCT RACEWAYS AND ELBOWS**

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria: UL CCN FJMX; including UL 797.
- B. Source Quality Control:
  - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:
  - 1. Material: Steel.
  - 2. Options:
    - a. Exterior Coating: Zinc.
    - b. Interior Coating: Zinc.
    - c. Minimum Trade Size: Metric designator 16 (trade size 1/2).

**2.2 TYPE ERMC-S DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES**

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria: UL CCN DYIX; including UL 6.

- B. Source Quality Control:
  - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:
  - 1. Exterior Coating: Zinc.
  - 2. Options:
    - a. Interior Coating: Zinc with organic top coating.
    - b. Minimum Trade Size: Metric designator 16 (trade size 1/2).
    - c. Colors: As indicated on Drawings.

### 2.3 TYPE FMC-S AND TYPE FMC-A DUCT RACEWAYS

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria: UL CCN DXUZ; including UL 1.
- B. Source Quality Control:
  - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DXUZ - Steel Flexible Metal Conduit (FMC-S):
  - 1. Material: Steel.
  - 2. Options:
    - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
    - b. Colors: As indicated on Drawings.

### 2.4 TYPE LFMC DUCT RACEWAYS

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria: UL CCN DXHR; including UL 360.
- B. Source Quality Control:
  - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DXHR - Steel Liquidtight Flexible Metal Conduit (LFMC-S):
  - 1. Material: Steel.
  - 2. Options:
    - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
    - b. Colors: As indicated on Drawings.

### 2.5 TYPE PVC DUCT RACEWAYS AND FITTINGS

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria: UL CCN DZYR; including UL 651.
- B. Source Quality Control:
  - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DZYR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:
  1. Dimensional Specifications: Schedule 40.
  2. Options:
    - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
    - b. Markings: For use with maximum 90 deg C wire.

## 2.6 FITTINGS FOR CONDUIT, TUBING, AND CABLE

- A. Performance Criteria:
  1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Source Quality Control:
  1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DWTT - Fittings for Type ERMC, Type IMC, Type PVC, Type HDPE, Type EPEC, and Type RTRC Duct Raceways:
  1. Listing Criteria: UL CCN DWTT; including UL 514B.
  2. Options:
    - a. Material: Die cast.
    - b. Coupling Method: Setscrew coupling. Setscrew couplings with only single screw per conduit are unacceptable.
    - c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

## 2.7 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

- A. Performance Criteria:
  1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  2. Listing Criteria: UL CCN FOIZ; including UL Subject 2419.
- B. Source Quality Control:
  1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

## 2.8 SOLVENT CEMENTS

- A. Performance Criteria:
  1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  2. Listing Criteria: UL CCN DWTT; including UL 514B.
- B. Source Quality Control:
  1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

## PART 3 - EXECUTION

### 3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:

1. Exposed and Subject to Severe Physical Damage: ERM C.
  2. Exposed and Subject to Physical Damage: ERM C.
    - a. Locations less than 2.5 m (8 ft) above finished floor.
    - b.
  3. Exposed and Not Subject to Physical Damage: PVC-80.
  4. Concealed Aboveground: ERM C.
  5. Direct Buried: PVC-40.
  6. Concrete Encased Not in Trench: PVC-40.
  7. Concrete Encased in Trench: PVC-40.
  8. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- C. Indoors:
1. Exposed and Subject to Severe Physical Damage: ERM C. Locations include the following:
    - a. Loading docks.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms.
    - d. Gymnasiums.
  2. Exposed and Not Subject to Physical Damage: EMT.
  3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  4. Damp or Wet Locations: ERM C.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- D. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
1. ERM C and IMC: Provide threaded-type fittings unless otherwise indicated.
- 3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS**
- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
1. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
  2. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
  3. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
  4. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
  5. Expansion Fittings: NEMA FB 2.40.
  6. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
1. General Requirements for Installation of Duct Raceways:
    - a. Complete duct raceway installation before starting conductor installation.
    - b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of **2 ft** above finished floor.
    - c. Install no more than equivalent of three 90-degree bends in conduit run except for control wiring conduits, for which no more than equivalent of two 90-degree fewer bends are permitted. Support within **12 inch** of changes in direction.
    - d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
    - e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
    - f. Support conduit within **12 inch** of enclosures to which attached.

- g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
  - h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct raceways at the following points:
    - 1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    - 2) Where an underground service duct raceway enters a building or structure.
    - 3) Conduit extending from interior to exterior of building.
    - 4) Conduit extending into pressurized duct raceway and equipment.
    - 5) Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
    - 6) Where otherwise required by NFPA 70.
  - i. Do not install duct raceways or electrical items on "explosion-relief" walls or rotating equipment.
  - j. Do not install conduits within **2 inch** of the bottom side of a metal deck roof.
  - k. Keep duct raceways at least **6 inch** away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
  - l. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
  - m. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than **200 lb** tensile strength. Leave at least **12 inch** of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
  - n. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
    - 1) Termination fittings with shoulders do not require two locknuts.
  - o. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- 2. Types EMT-A, ERM-C-A, and FMC-A: Do not install aluminum duct raceways or fittings in contact with concrete or earth.
  - 3. Types ERM-C and IMC:
    - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.
  - 4. Type ERM-C-S-PVC:
    - a. Follow manufacturer's installation instructions for clamping, cutting, threading, bending, and assembly.
    - b. Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERM-C-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit

- hub. PVC-coated sealing locknut must cover exposed threads on Type ERM-C-S-PVC duct raceway.
- c. Coat field-cut threads on PVC-coated duct raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.
5. Types FMC, LFMC, and LFNC:
    - a. Provide a maximum of 72 inch of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  6. Types PVC, HDPE, and EPEC:
    - a. Do not install Type PVC, Type HDPE, or Type EPEC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
    - b. Comply with manufacturer's published instructions for solvent welding and fittings.
  7. Type RTRC: Do not install Type RTRC conduit where ambient temperature exceeds 230 deg F.
  8. Duct Raceways Embedded in Slabs:
    - a. Run duct raceways larger than metric designator 27 (trade size 1) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place duct raceway close to slab support. Secure duct raceways to reinforcement at maximum 10 ft intervals.
    - b. Arrange duct raceways to cross building expansion joints with expansion fittings at right angles to the joint.
    - c. Arrange duct raceways to ensure that each is surrounded by minimum of 2 inch of concrete without voids.
    - d. Do not embed threadless fittings in concrete unless locations have been specifically approved by Architect.
    - e. Change from ENT to ERM-C before rising above floor.
  9. Stub-ups to Above Recessed Ceilings:
    - a. Provide EMT, IMC, or ERM-C for duct raceways.
    - b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
  10. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:
    - a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG. Install insulated throat metal grounding bushings on service conduits.
  11. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.
    - a. ERM-C-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
    - b. EMT: Provide setscrew, cast-metal fittings. Comply with NEMA FB 2.10.
    - c. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.
  12. Expansion-Joint Fittings:
    - a. Install in runs of aboveground PVC that are located where environmental temperature change may exceed **30 deg F** and that have straight-run length that exceeds **25 ft**. Install in runs of aboveground ERM-C and EMT conduit that are

- located where environmental temperature change may exceed **100 deg F** and that have straight-run length that exceeds **100 ft**.
- b. Install type and quantity of fittings that accommodate temperature change listed for the following locations:
    - 1) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    - 2) Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    - 3) Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    - 4) Attics: 135 deg F temperature change.
  - c. Install fitting(s) that provide expansion and contraction for at least **0.00041 inch per foot of length of straight run per deg F** of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least **0.000078 inch per foot of length of straight run per deg F** of temperature change for metal conduits.
  - d. Install expansion fittings at locations where conduits cross building or structure expansion joints.
  - e. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
13. Duct Raceways Penetrating Rooms or Walls with Acoustical Requirements: Seal duct raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.
14. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.
- a. Provide warning signs.
- D. Interfaces with Other Work:
- 1. Coordinate installation of new products for with existing conditions.
  - 2. Coordinate with Section 07 8413 "Penetration Firestopping" for installation of firestopping at penetrations of fire-rated floor and wall assemblies.
  - 3. Coordinate with Section 26 0529 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.
- 3.3 PROTECTION**
- A. Protect coatings, finishes, and cabinets from damage and deterioration.
- 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION 26 0533.13**



**SECTION 26 0533.16 - BOXES AND COVERS FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Metallic outlet boxes, device boxes, rings, and covers.
  - 2. Nonmetallic outlet boxes, device boxes, rings, and covers.
  - 3. Junction boxes and pull boxes.
  - 4. Cover plates for device boxes.
  - 5. Hoods for outlet boxes.
- B. Related Requirements:
  - 1. Section 26 0010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
  - 2. Section 26 0011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

**PART 2 - PRODUCTS****2.1 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS**

- A. Performance Criteria:
    - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
    - 2. Listing Criteria: UL CCN QCIT; including UL 514A.
  - B. UL QCIT - Metallic Outlet Boxes and Covers:
    - 1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
    - 2. Options:
      - a. Material: Sheet steel.
      - b. Sheet Metal Depth: Minimum 2.5 inch.
      - c. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing more than 50 lb and marked with maximum allowable weight.
      - d. Paddle Fan Outlet Boxes and Covers: Nonadjustable, designed for attachment of paddle fan weighing up to **70 lb**.
  - C. UL QCIT - Metallic Conduit Bodies:
    - 1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
  - D. UL QCIT - Metallic Device Boxes:
    - 1. Description: Box with provisions for mounting wiring device directly to box.
    - 2. Options:
      - a. Material: Sheet steel.
      - b. Sheet Metal Depth: minimum 2.5 inch.
  - E. UL QCIT - Metallic Extension Rings:
    - 1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.
  - F. UL QCIT - Metallic Concrete Boxes and Covers:
    - 1. Description: Box intended for use in poured concrete.
- 2.2 NONMETALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS**
- A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  2. Listing Criteria: UL CCN QCMZ; including UL 514C.
- B. Source Quality Control:
1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL QCMZ - Nonmetallic Outlet Boxes and Covers:
1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
- D. UL QCMZ - Nonmetallic Conduit Bodies:
1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
- E. UL QCMZ - Nonmetallic Device Boxes:
1. Description: Box with provisions for mounting wiring device directly to box.
- F. UL QCMZ - Nonmetallic Extension Rings:
1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.
- G. UL QCMZ - Nonmetallic Concrete Boxes and Covers:
1. Description: Box intended for use in poured concrete.

### 2.3 JUNCTION BOXES AND PULL BOXES

- A. Performance Criteria:
1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  2. Listing Criteria: UL CCN BGUI; including UL 50 and UL 50E.
- B. Source Quality Control:
1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL BGUI - Indoor Sheet Metal Junction and Pull Boxes:
1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- D. UL BGUI - Outdoor Cast-Metal Junction and Pull Boxes:
1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- E. UL BGUI - Outdoor Polymeric Junction and Pull Boxes:
1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

### 2.4 COVER PLATES FOR DEVICES BOXES

- A. Performance Criteria:
1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  2. Listing Criteria: UL CCN QCIT or UL CCN QCMZ; including UL 514D.
  3. Wallplate-Securing Screws: Metal with head color to match wallplate finish.
- B. Source Quality Control:
1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:
1. Options:

- a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
  - b. Wallplate Material: 0.032 inch thick, Type 302/304 non-magnetic stainless steel with brushed finish.
- D. UL QCIT or QCMZ - Illuminating Cover Plates for Device Boxes:
- 1. Options:
    - a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
    - b. Wallplate Material: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device.
    - c. Color: White.

## 2.5 HOODS FOR OUTLET BOXES

- A. Performance Criteria:
- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - 2. Listing Criteria:
    - a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.
    - b. Receptacle, Hood, Cover Plate, Gaskets, and Seals: UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
  - 3. Mounts to box using fasteners different from wiring device.
- B. Source Quality Control:
- 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL QCIT or QCMZ - Retractable or Reattachable Hoods for Outlet Boxes:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABB, Electrification Business
    - b. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated
  - 2. Options:
    - a. Provides gray, weatherproof, "while-in-use" cover.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Shop Drawings: Prepare and submit the following:
- 1. Shop Drawings for Floor Boxes: Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness at location where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

### 3.2 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
- B. Degree of Protection:
- 1. Outdoors:
    - a. Type 3R unless otherwise indicated.
    - b. Locations Exposed to Hosedown: Type 4.
    - c. Locations Subject to Potential Flooding: Type 6P.
    - d. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.

- e. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.
  - f. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.
2. Indoors:
- a. Type 1 unless otherwise indicated.
  - b. Damp or Dusty Locations: Type 12.
  - c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
  - d. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12K.
  - e. Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: Type 4.
  - f. Locations Exposed to Hosedown: Type 4.
  - g. Locations Exposed to Brief Submersion: Type 6.
  - h. Locations Exposed to Prolonged Submersion: Type 6P.
  - i. Locations Exposed to Corrosive Agents: Type 4X.
  - j. Locations Exposed to Spraying Oil or Coolants: Type 13.
- C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:
- 1. Provide cast-metal boxes.
  - 2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

### 3.3 **INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS**

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
  - 1. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
  - 2. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
  - 1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
  - 2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.
  - 3. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
  - 4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
  - 5. Locate boxes so that cover or plate will not span different building finishes.
  - 6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
  - 7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
  - 8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
  - 9. Set metal floor boxes level and flush with finished floor surface.
  - 10. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
  - 11. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
  - 12. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
  - 13. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

- a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
    - b. Provide gaskets for wallplates and covers.
  - 14. Identification: Provide labels for boxes and associated electrical equipment.
    - a. Identify field-installed conductors, interconnecting wiring, and components.
    - b. Provide warning signs.
    - c. Label each box with engraved metal or laminated-plastic nameplate.
  - D. Interfaces with Other Work:
    - 1. Coordinate installation of new products for with existing conditions.
      - a. .
- 3.4 CLEANING**
- A. Remove construction dust and debris from boxes before installing wallplates, covers, and hoods.
- 3.5 PROTECTION**
- A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

**END OF SECTION 26 0533.16**



**SECTION 26 0544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Round sleeves.
  2. Rectangular sleeves.
  3. Sleeve-seal systems.
  4. Sleeve-seal fittings.
  5. Grout.
  6. Pourable sealants.
  7. Foam sealants.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

**PART 2 - PRODUCTS****2.1 ROUND SLEEVES**

- A. Steel Wall Sleeves:
1. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.
- B. Cast-Iron Wall Sleeves:
1. General Characteristics: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.
- C. Round, Galvanized-Steel, Sheet Metal Sleeves:
1. General Characteristics: Galvanized-steel sheet; thickness not less than **0.0239 inch**; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

**2.2 RECTANGULAR SLEEVES**

- A. Rectangular, Galvanized-Steel, Sheet Metal Sleeves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Wiremold; Legrand North America, LLC
  2. General Characteristics:
    - a. Material: Galvanized sheet steel.
    - b. Minimum Metal Thickness:
      - 1) For sleeve cross-section rectangle perimeter less than **50 inch** and with no side larger than **16 inch**, thickness must be **0.052 inch**.
      - 2) For sleeve cross-section rectangle perimeter not less than **50 inch** or with one or more sides larger than **16 inch**, thickness must be **0.138 inch**.

**2.3 SLEEVE-SEAL SYSTEMS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advance Products & Systems, LLC
  2. American Polywater Corporation
  3. BWM Company
  4. CALPICO, Inc.
  5. Flexicraft Industries
  6. GPT; a division of EnPRO Industries
  7. Metraflex Company (The)
  8. Proco Products, Inc
  9. Roptec Inc.

- B. General Characteristics: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.
- C. Options:
  1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  2. Pressure Plates: Carbon steel.
  3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

#### 2.4 SLEEVE-SEAL FITTINGS

- A. General Characteristics: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit must have plastic or rubber waterstop collar with center opening to match piping OD.

#### 2.5 GROUT

- A. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
  1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
  2. Design Mix: **5000 psi**, 28-day compressive strength.
  3. Packaging: Premixed and factory packaged.

#### 2.6 POURABLE SEALANTS

- A. Performance Criteria:
  1. General Characteristics: Single-component, neutral-curing elastomeric sealants of grade indicated below.
    - a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

#### 2.7 FOAM SEALANTS

- A. Performance Criteria:
  1. General Characteristics: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:
  1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
    - b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 9200 "Joint Sealants."
  2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve-seal system is to be installed or seismic criteria require different clearance.
  4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
  5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inch above finished floor level. Install sleeves during erection of floors.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:
  1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for wall assemblies.
  - C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
  - D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for **1 inch** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - E. Underground, Exterior-Wall and Floor Penetrations:
    1. Install cast-iron pipe sleeves with integral waterstops. Size sleeves to allow for **1 inch** annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Install sleeve during construction of floor or wall.
    2. Install steel pipe sleeves. Size sleeves to allow for **1 inch** annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Grout sleeve into wall or floor opening.
- 3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS**
- A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.
  - B. Install conduits and cable with no crossings within the sleeve.
  - C. Fill opening around conduits and cables with expanding foam without leaving voids.
  - D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.
- 3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS**
- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
  - B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

**END OF SECTION 26 0544**

