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**BID DOCUMENTS**

**CHEROKEE HARD ROCK HOTEL AND  
CASINO  
EXTERIOR FACADE RENOVATION**

**PROJECT #H17018.02**

**December 21, 2018**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Work covered by the Contract Documents.
  - 2. Use of premises.
  - 3. Owner's occupancy requirements.
  - 4. Work restrictions.
  - 5. Specification formats and conventions.

1.3 PROJECT INFORMATION:

- A. Project Identification:
  - 1. Project Location: Hard Rock Casino 4, Catoosa, Oklahoma.
- B. Owner: Cherokee Nation Entertainment, LLC
- C. Architect: Edmondson Reed Associates, 1401 S. Denver Avenue, Suite B, Tulsa, Oklahoma 74119.
  - 1. Associate Architect: JCJ Architecture, 120 Huyshope Avenue, Suite 400, Hartford, Connecticut, 06106.

1.4 WORK COVERED BY CONTRACT DOCUMENTS:

- A. The Work consists of construction of exterior facade renovation.
- B. The Work includes trades described in the complete project manual including but not limited to cast-in-place concrete, light gage steel framing, structural steel, carpentry, exterior insulation and finish system, single-ply membrane roofing, aluminum storefront, doors, glazing, interior finishes, plumbing, electrical, electrical systems, lighting, low voltage systems, and other related systems.

1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

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- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways and Entrances: Keep driveways, sidewalks, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

**1.6 COORDINATION WITH OCCUPANTS:**

- A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
1. Architect will prepare a Certificate of Substantial Completion for the Work to be occupied prior to Owner acceptance of the completed Work.
  2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
  3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
  4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

**1.7 WORK RESTRICTIONS**

- A. On-Site Work Hours: Subject to requirements of the Owner, work shall be scheduled as required and approved by the Owner to maintain the Project Schedule.
1. Weekend Hours: As approved by the Owner.
  2. Hours for Utility Shutdowns: As approved by the Owner, minimum three business days notice.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner not less than three days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Owner's written permission.
- C. Nonsmoking Facility: Smoking is not permitted on the site.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat 2004" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
  2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes:
  - 1. Procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS:

- A. Definitions used below are not intended to change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions". The following are not considered substitutions:
  - 1. Revisions to Contract Documents requested by the Owner or Architect.
  - 2. Specified options of products and construction methods included in Contract Documents.
  - 3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.
- C. Substitutions requested by Bidders during the bidding period will not be accepted.

1.4 SUBMITTALS:

- A. Substitution Request Submittal:
  - 1. Requests for substitution will be considered if received within 60 days after Notice to Proceed. Requests received more than 60 days after Notice to Proceed may be considered or rejected at the discretion of the Architect.
  - 2. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.
  - 3. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawings numbers.

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4. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
  - a. Statement indication why specified material or product cannot be provided.
  - b. Product data, including Drawings and descriptions of products, fabrication and installation procedures.
  - c. Samples, where applicable or requested.
  - d. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as performance, size, weight, durability, visual effect, specific features and requirements indicated.
  - e. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.
  - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
  - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
  - j. Cost information, including a detailed labor and material proposal of the net change, if any in the Contract Sum.
  - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
  - l. Include the Contractor's waiver of rights to additional payment or extension of time, that may subsequently become necessary because of the failure of the substitution to perform adequately.

**B. Architect's Action:**

1. Within one week of receipt of the request for substitution, the Architect will request additional information or documentation necessary for evaluation of the request.
2. Within 2 weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution.
3. Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.
4. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name.
5. Acceptance will be in the form of a Change Order.



PART 2 - PRODUCTS

2.1 SUBSTITUTIONS:

- A. Timing: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
  
- B. The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect, otherwise requests will be returned without action except to record non-compliance with these requirements.
  - 1. Extensive revisions to Contract Documents are not required.
  - 2. Proposed changes are in keeping with the general intent of Contract Documents.
  - 3. The request is timely, fully documented and properly submitted.
  - 4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
  - 5. The specified product or method of construction cannot be provided within the Contract Time.
    - a. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
  - 6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
  - 7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear.
    - a. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate contractors, and similar considerations.
  - 8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
  - 9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
  - 10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
  
- C. The Substitution request shall comply with the following requirements are met:
  - 1. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

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2. Evidence that proposed product provides specified warranty.
  3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  4. Samples, if requested.
- D. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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Project: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_  
From: \_\_\_\_\_  
To: \_\_\_\_\_ Date: \_\_\_\_\_  
A/E Project Number: \_\_\_\_\_  
Re: \_\_\_\_\_ Contract For: \_\_\_\_\_

---

Specification Title: \_\_\_\_\_ Description: \_\_\_\_\_  
Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

---

Proposed Substitution: \_\_\_\_\_  
Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_  
Installer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_  
History:  New Product  1-4 years old  5-10 years old  More than 10 years old

Differences between proposed substitution and specified product: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Point- by point comparative data attached - REQUIRED BY A/E

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Reason for not providing specified item: \_\_\_\_\_  
\_\_\_\_\_

Similar Installation:

Project: \_\_\_\_\_ Architect: \_\_\_\_\_  
Address: \_\_\_\_\_ Owner: \_\_\_\_\_  
Date Installed: \_\_\_\_\_

Proposed substitution affects other parts of Work:  No  Yes; explain \_\_\_\_\_  
\_\_\_\_\_

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Savings to Owner for accepting substitution: \_\_\_\_\_ (\$ \_\_\_\_\_).

Proposed substitution changes Contract Time:  No  Yes [Add] [Deduct] \_\_\_\_\_ days.

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Supporting Data Attached:  Drawings  Product Data  Samples  Tests  Reports  \_\_\_\_\_

# SUBSTITUTION REQUEST

(After Award of Contract - Continued)

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The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
  - Same warranty will be furnished for proposed substitution as for specified product.
  - Same maintenance service and source of replacement parts, as applicable, is available.
  - Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
  - Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
  - Proposed substitution does not affect dimensions and functional clearances.
  - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
  - Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
- 

Submitted by: \_\_\_\_\_

Signed by: \_\_\_\_\_

Firm: \_\_\_\_\_

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

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

Attachments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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## A/E REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: \_\_\_\_\_

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Additional Comments:     Contractor     Subcontractor     Supplier     Manufacturer     A/E     \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including terms and conditions, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Administrative and supervisory personnel.
  - 3. Project meetings.
  - 4. Requests for Interpretation (RFIs).
- B. Each contractor shall participate in coordination requirements.
- C. Related Sections include the following:
  - 1. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS:

- A. RFI: Request from Construction Manager seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION:

- A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

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- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Construction Manager's Construction Schedule.
  2. Preparation of the Schedule of Values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.
  9. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

**1.5 SUBMITTALS:**

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate required installation sequences.
    - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
  2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
  3. Number of Copies: Submit four opaque copies of each submittal. Architect will return one copy.
    - a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect will retain one copy; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
  4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

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- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL:

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.

1.7 PROJECT MEETINGS:

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Construction Manager, Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for RFIs.
    - g. Procedures for testing and inspecting.
    - h. Procedures for processing Applications for Payment.
    - i. Distribution of the Contract Documents.
    - j. Submittal procedures.
    - k. Preparation of Record Documents.
    - l. Use of the premises.
    - m. Work restrictions.
    - n. Owner's occupancy requirements.
    - o. Responsibility for temporary facilities and controls.
    - p. Construction waste management and recycling.
    - q. Parking availability.
    - r. Office, work, and storage areas.

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- s. Equipment deliveries and priorities.
  - t. First aid.
  - u. Security.
  - v. Progress cleaning.
  - w. Working hours.
3. Minutes: Architect will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility problems.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written recommendations.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.



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- D. Progress Meetings: Conduct progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Construction Manager's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Construction Manager's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) RFIs.
      - 16) Status of proposal requests.
      - 17) Pending changes.
      - 18) Status of Change Orders.
      - 19) Pending claims and disputes.
      - 20) Documentation of information for payment requests.
  3. Minutes: Architect will record the meeting minutes.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    - a. Schedule Updating: Revise Construction Manager's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

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

**1.8 REQUESTS FOR INTERPRETATION (RFIs):**

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Construction Manager. RFIs submitted by entities other than Construction Manager will be returned with no response.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Construction Manager's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
  2. Date.

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3. Name of Construction Manager.
  4. Name of Contractor.
  5. Name of Architect.
  6. RFI number, numbered sequentially.
  7. Specification Section number and title and related paragraphs, as appropriate.
  8. Drawing number and detail references, as appropriate.
  9. Field dimensions and conditions, as appropriate.
  10. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  11. Contractor's signature.
  12. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs: Form at end of this Section.
1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for coordination information already indicated in the Contract Documents.
    - d. Requests for adjustments in the Contract Time or the Contract Sum.
    - e. Requests for interpretation of Architect's actions on submittals.
    - f. Incomplete RFIs or RFIs with numerous errors.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Construction Manager to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
    - a. If Construction Manager believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Construction Manager disagrees with response.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
1. Project name.
  2. Name and address of Construction Manager.

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3. Name and address of Contractor.
4. Name and address of Architect.
5. RFI number including RFIs that were dropped and not submitted.
6. RFI description.
7. Date the RFI was submitted.
8. Date Architect's response was received.
9. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:
  - 1. Construction Manager's construction schedule.
  - 2. Submittal schedule.
  - 3. Material and equipment suppliers warranty certifications.
  - 4. Shop Drawings.
  - 5. Product Data.
  - 6. Samples.
  - 7. Quality assurance submittals.
- B. Administrative Submittals: Refer to other Division 01 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
  - 1. Permits.
  - 2. Applications for Payment.
  - 3. Cost Correlation Schedule. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.
  - 4. Performance and payment bonds.
  - 5. Insurance certificates.
  - 6. List of subcontractors.
  - 7. MSDS (Material Safety Data Sheets).
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  - 2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Construction Manager's construction schedule.
  - 3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 5. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
- D. Coordinate work with that of all other trades affecting, or affected by work of this Section.

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Cooperate with such trades to assure the steady progress of all work under the Contract.

**1.3 DEFINITIONS:**

- A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.
  - 1. Preparation of Coordination Drawings is specified in Division 1 Section "Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.
- B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.
- C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.
- D. Action Submittals: Written and graphic information that requires Architect's responsive action.
- E. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.
- F. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- G. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

**1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS:**

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Construction Manager's use in preparing submittals.
  - 1. Architect will furnish Construction Manager one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD 2014, Microsoft Windows.
    - c. Each Contractor shall execute a data licensing agreement form "Release of CAD Files" included in Project Manual.
    - d. The following digital data files will be furnished for each appropriate discipline:
      - 1) Floor plans.
      - 2) Reflected ceiling plans.

1.5 CONSTRUCTION MANAGER'S CONSTRUCTION SCHEDULE:

- A. Construction Manager's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect. Maintain copies in the Project meeting room and temporary field office.
  - 1. When revisions are made, redistribute to the same parties, and maintain copies in the Project meeting room and temporary field office.
- C. Schedule Updating: Revise the schedule to coincide with the time period included with each Application for Payment. Submit revised schedules with each Application for Payment.

1.6 SUBMITTAL SCHEDULE:

- A. Within four weeks of award of the Contract for General Construction, prepare and submit a complete schedule of submittals.
  - 1. The schedule shall indicate by Trade the date by which final approval of each item must be obtained, and shall be revised as required by conditions of work, subject to Architect's approval.
  - 2. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Construction Manager's Construction Schedule.
  - 3. Arrange the schedule in the same sequence as the technical specification sections. Provide the following information:
    - a. Related Section number.
    - b. Scheduled date for the submittal.
    - c. Submittal category (Shop Drawings, Product Data, or Samples).
    - d. Name of the subcontractor.
    - e. Description of the part of the Work covered.
    - f. Scheduled date for the Architect's final release or approval.
  - 4. Submit product schedule in the following format:
    - a. PDF electronic file.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect. Maintain copies in the Project meeting room and field office.
  - 1. When revisions are made, resubmit to the Architect.
- C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule every two to four weeks.

1.7 SHOP DRAWINGS:

- A. Submit newly prepared information drawn accurately to scale. Do not reproduce Contract Documents as the basis of Shop Drawings.
- B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following Project specific information:
  - 1. Dimensions.
  - 2. Identification of products and materials included by sheet and detail number.
  - 3. Compliance with specified standards.
  - 4. Notation of coordination requirements.
  - 5. Notation of dimensions established by field measurement.
  - 6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
  - 7. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
  - 8. Distribution: Furnish copies of the Architect's reviewed final submittal to others required for performance of constructions activities.
    - a. Furnish one (1) hard copy of all approved submittals to Owner.
    - b. Construction Manager is responsible for distribution to all Trades.

1.8 PRODUCT DATA:

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
  - 1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
    - a. Manufacturer's printed recommendations.
    - b. Compliance with trade association standards.
    - c. Compliance with recognized testing agency standards.
    - d. Application of testing agency labels and seals.
    - e. Notation of dimensions verified by field measurement.
    - f. Notation of coordination requirements.
  - 2. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.



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3. Submit Product Data before or concurrent with Samples.
4. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
5. Submit Product Data in the following format:
  - a. PDF electronic file.
6. Distribution: Furnish copies of the Architect's reviewed final submittal to others required for performance of construction activities.

**1.9 SAMPLES:**

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
  1. Mount or display Samples in a manner to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample. Include the following:
    - a. Specification Section number and reference.
    - b. Generic description of the Sample.
    - c. Sample source.
    - d. Product name or name of the manufacturer.
    - e. Compliance with recognized standards.
    - f. Availability and delivery time.
  2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
    - a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.
    - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
    - c. Refer to other Sections for Samples to be returned to the Construction Manager for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
    - d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Construction Manager and shall be removed from the site prior to Substantial Completion.
  3. Preliminary Submittals (for initial selection of finishes): Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices.

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- a. The Architect will review and return preliminary submittals with the Architect's notation, indicating selection and other action.
  
4. Quantity: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 1 set. The Architect will return that set marked with the action taken.
5. Construction Manager shall maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
  - a. Sample sets may be used to obtain final acceptance of the construction associated with each set.
  
6. Distribution of Samples: Prepare and distribute additional sets to others as required for performance of the Work.
  
- B. Field Samples (Mockups): Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.
  1. Comply with submittal requirements. Process transmittal/submittal coversheet forms to provide a record of activity.

**1.10 COORDINATION DRAWINGS:**

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
  1. Indicate relationship of components shown on separate Shop Drawings.
  2. Indicate required installation sequences.
  3. Coordination Drawing requirements for mechanical and electrical installations. Refer to the following Sections for coordination requirements:
    - a. Section 200050 - General Conditions for Mechanical and Electrical Systems.

**1.11 INFORMATIONAL SUBMITTALS:**

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
  1. Submit Informational submittals in the following format:
    - a. PDF electronic file.
  
  2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  
  3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."

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- B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- I. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- J. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.

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5. Description of product.
  6. Test procedures and results.
  7. Limitations of use.
- N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Operation and Maintenance Data."
- O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
  2. Required substrate tolerances.
  3. Sequence of installation or erection.
  4. Required installation tolerances.
  5. Required adjustments.
  6. Recommendations for cleaning and protection.
- Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- S. Material Safety Data Sheets: Submit information directly to Construction Manager. If submitted to Architect, Architect will not review this information but will return it with no action taken.

1.12 MATERIAL AND EQUIPMENT SUPPLIERS :

- A. Along with the Construction Schedule and Submittal Schedule, submit documents from material

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and equipment producers proposed for use on this project, acceptance of conditions and warranty requirements as set forth in the Specifications. Failure to provide documentation may result in delay or rejection of payment for the labor and materials associated with the missing material and equipment certifications.

- a. Documentation from material, or equipment suppliers, sales representatives or distributors is not acceptable.

1.13 QUALITY ASSURANCE SUBMITTALS:

- A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
  1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.
- C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Requirements."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES:

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  1. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.
    - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

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- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay. Transmit submittals independently from other Project correspondence.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received. The Contractor through the Construction Manager will be notified if the Architect has determined to withhold action.
  3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
    - a. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Construction Manager when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 10 days for review of each resubmittal.
  4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 10 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor through the Construction Manager.
- D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide means for insertion to permanently record Construction Manager's review and approval markings and action taken by Architect.
    - a. Construction Manager's review and approval markings, and the action taken.
    - b. Contractor's review and approval markings, and the action taken.
    - c. Engineer's review and approval markings, and the action taken.
    - d. Architect's review and approval markings, and the action taken.

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2. Include the following information on the label for processing and recording action taken.
    - a. Project name.
    - b. Date.
    - c. Name and address of the Architect.
    - d. Name and address of the Construction Manager.
    - e. Name and address of the subcontractor.
    - f. Name and address of the supplier.
    - g. Name of the manufacturer.
    - h. Number and title of appropriate Specification Section with revision number.
    - i. Drawing number and detail references, as appropriate, with revision number.
  3. Highlight, encircle, or "cloud" deviations, comments and/or questions which conflict with the Contract Documents to facilitate review.
  4. Collate multiple sheets or copies into sets.
  5. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  6. Metadata: Include the following information as keywords in the electronic submittal file metadata:
    - a. Project name.
    - b. Number and title of appropriate Specification Section.
    - c. Manufacturer name.
    - d. Product name.
- E. Submittal Transmittal: Transmit each submittal attached to a completed transmittal/submittal coversheet. The Architect will review submittals only if accompanied by a transmittal/submittal coversheet. Use sample form attached at the end of this Section.
1. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an numeric suffix after a dash (e.g., LNHS-061000.01-001).
  2. On the transmittal/submittal coversheet, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Construction Manager's certification that information complies with Contract Document requirements.
  3. For submittals requiring review by the Architect's consultants or engineers, forward submittals directly to the respective consultants or engineers. Send a corresponding copy of the transmittal/submittal coversheet to the Architect for tracking purposes.
  4. On each coversheet, each reviewer shall stamp "Received" and indicate the date received, in the box provided on the Transmittal/Submittal Cover Sheet. Reviewers include Construction Manager, Contractor, Consultants and Architect.
  5. The Architect will not accept submittals received from sources other than the Construction Manager.
  6. Reviewers shall stamp submittals with a "Received stamp indicating the date received as follows:

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- a. Shop Drawings: Stamp each individual drawing or sheet.
- b. Product Data: Stamp front cover of bound literature.
- c. Samples: Attach a self-adhering blank label and stamp the label.

**3.2 CONSTRUCTION MANAGER'S REVIEW**

- A. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Construction Manager's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- B. Proceed with execution of the Work, documented by applicable submittals, using only shop drawings, product data and samples indicating Architect's action.
- C. Submittal sent to the Architect without the Contractor's stamp of review, submittal shall be returned to the Contractor through the Construction Manager with no action taken by the Architect.
- D. The Construction Manager is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating his work with that of all other Trades.

**3.3 ARCHITECT'S ACTION:**

- A. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.
  1. Compliance with specified characteristics is the Construction Manager's responsibility.
- B. Action Stamp: The Architect will stamp each submittal with a uniform action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:
  1. No Exceptions: When the Architect marks a submittal "No Exceptions," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
  2. Amend As Noted: When the Architect marks a submittal "Amend As Noted," the Work covered by the submittal may proceed provided it complies with notations on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
  3. Resubmit: When the Architect marks a submittal "Resubmit," the Work covered by the submittal may proceed, except in those portions of the Work designated to be resubmitted. Revise or prepare a new submittal, responding to the notations. Resubmit without delay.
  4. Rejected: When the Architect marks a submittal "Rejected," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.



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- a. Do not use, or allow others to use, submittals marked "Rejected" at the Project Site or elsewhere where Work is in progress.
- C. Unsolicited Submittals: The Architect will not review, and will not return unsolicited submittals to the Construction Manager.

END OF SECTION 013300



**Transmittal/Submittal Coversheet**

\$

Contractor: \_\_\_\_\_

Project #H17018.01

Project: **Cherokee Hard Rock Casino 4**

Spec. Division \_\_\_\_\_

Submittal Number \_\_\_\_\_

Spec. Section \_\_\_\_\_

Subcontractor/Supplier \_\_\_\_\_

QUANTITY	ITEM

**Contractor**      Rec'd from Sub/Supplier      Date: \_\_\_\_\_      Quantity Sent: \_\_\_\_\_

Sent to:     JCJ      Date: \_\_\_\_\_      Action: \_\_\_\_\_

Consultant: \_\_\_\_\_

cc: \_\_\_\_\_

**Consultant:**      Rec'd from Contractor:      Date: \_\_\_\_\_      Quantity Sent: \_\_\_\_\_

Sent to JCJ:      Date: \_\_\_\_\_      Action: \_\_\_\_\_

**JCJ:**      Rec'd from:     Contractor      Date: \_\_\_\_\_      Quantity Sent: \_\_\_\_\_

Consultant

Sent to Contractor:      Date: \_\_\_\_\_      Action: \_\_\_\_\_

Architect's Distribution Main File:# **H17018.01**

Architect  
JCJ Architecture

Project Representative:

Attn: ( )

<b>Action Key</b> NET/No Exception AN/Amend as Noted RS/Resubmit R/Rejected
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Date received By .C.M.	Date Received By Consultant	Date Received By JCJ
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PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. Administrative and procedural requirements for quality assurance, special testing, and quality control.
- B. The requirements of this Section apply to customized fabrication and installation procedures, not to the production of standard products.
- C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- D. Related Sections include the following:
  - 1. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
  - 2. Divisions 01 Sections for specific test and inspection requirements.

1.3 DEFINITIONS:

- A. **Quality-Assurance Services:** Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. **Quality-Control Services:** Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

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- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

**1.4 DELEGATED DESIGN:**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

**1.5 SUBMITTALS:**

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.
  - 3. Identification of applicable standards.
  - 4. Identification of test and inspection methods.
  - 5. Number of tests and inspections required.
  - 6. Time schedule or time span for tests and inspections.
  - 7. Entity responsible for performing tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.
- D. Reports: Prepare and submit certified written reports that include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.

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4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Comments or professional opinion as to whether inspected or tested work complies with requirements of the Contract Documents.
  11. Ambient conditions at time of sample taking and testing and inspecting.
  12. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  13. Name and signature of laboratory inspector.
  14. Recommendations on retesting and reinspecting.
- E. Submit to Architect 3 copies of certified written report of each inspection, test or similar service.
1. Provide one copy to Owner's Representative.
  2. Provide additional copies of reports, as required for authorities having jurisdiction, to the Architect for distribution.
  3. Provide required number of copies to the Contractor for his record.
- F. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

**1.6 REQUIREMENTS:**

- A. Inspection and testing services are intended to verify compliance with the requirements of the Contract Documents.
- B. Quality control services do not relieve the Contractor of responsibility for compliance with requirements of the Contract Documents. Requirements for the Contractor to provide quality control services are not limited by the provisions of this Section.
- C. Quality control services include inspections and tests and related actions including reports, performed by independent agencies and governing authorities, as well as by the Contractor. They do not include Contract interpretations and decisions rendered by the Architect.
- D. Specific quality control requirements for an individual unit of work is specified in the Section of the Specifications that includes that element of the Work. These requirements, including inspections and tests, cover both production of standard products, and fabrication of customized work. These requirements also cover quality control of the installation procedures.
- E. Inspections, tests and related actions specified are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the Contract Documents.

1.7 RESPONSIBILITIES:

- A. The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity.
- B. These control services include those specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the Contract Sum.
- C. The Owner will engage and pay for the services of an independent agency to perform inspections and tests specified as the Owner's responsibility.

1.8 RETESTING:

- A. The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
- B. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

1.9 ASSOCIATED SERVICES:

- A. The Contractor shall cooperate with agencies performing required inspections, tests and similar services and shall provide reasonable auxiliary services as requested.
- B. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel.
- C. Auxiliary services required include but are not limited to:
  - 1. Providing access to the Work and furnishing the incidental labor and facilities necessary to facilitate inspections and tests.
  - 2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
  - 3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
  - 4. Providing the testing agency with a preliminary design mix proposed for use for material mixes that require control by the testing agency.
  - 5. Security and protection of samples and test equipment at the Project site.

1.10 COORDINATION:

- A. The Contractor shall coordinate the sequence of activities to accommodate required inspection and test services with a minimum of delay.

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- B. The Contractor shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
- C. The Contractor shall be responsible for scheduling inspections, tests, taking of samples and similar activities.
- D. The Contractor shall bear costs of removing and replacing work to accommodate scheduled inspections and tests.

**1.11 QUALITY ASSURANCE:**

- A. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- C. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- D. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. **Specialists:** Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. **Testing Agency Qualifications:** An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.



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- H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
1. Contractor responsibilities include the following:
    - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
    - d. When testing is complete, remove assemblies; do not reuse materials on Project.
  2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, and to Owner's Representative with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect a minimum of seven days in advance of dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
  5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  6. Demolish and remove mockups when directed, unless otherwise indicated.

**1.12 QUALITY CONTROL:**

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

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- B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
  2. Notify testing agencies and Owners Representative at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
  3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  5. Testing agency will retest and reinspect corrected work.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Interpret tests and inspections and state in each report whether tested and inspected work

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complies with or deviates from requirements.

3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
  5. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field-curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

**PART 2 - PRODUCTS** (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION:

- A. Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate resulting imperfections, including flaws in visual qualities of finishes.
  - 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
- B. Comply with the Contract Document requirements for cutting and patching.
- C. Protect construction exposed by or for quality-control service activities.
- D. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DEFINITIONS:

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Coordinate": Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- D. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- E. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- F. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- G. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- H. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- I. "Provide": Furnish and install, complete and ready for the intended use.
- J. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

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- K. "Typical": Having or showing the characteristics, qualities of a kind, class or group so fully as to be a representative example.

1.3 INDUSTRY STANDARDS:

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS:

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
  2. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
  3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
  4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
  5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
  6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
  7. ABMA - American Boiler Manufacturers Association; [www.abma.com](http://www.abma.com).
  8. ACI - American Concrete Institute; (Formerly: ACI International); [www.abma.com](http://www.abma.com).
  9. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
  10. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
  11. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
  12. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
  13. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
  14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).

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15. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
16. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
17. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
18. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
19. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
20. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
21. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
22. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
23. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
24. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
25. API - American Petroleum Institute; [www.api.org](http://www.api.org).
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
29. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
32. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
33. ASSE - American Society of Safety Engineers (The); [www.asse.org](http://www.asse.org).
34. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
35. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
36. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
37. AWEA - American Wind Energy Association; [www.awea.org](http://www.awea.org).
38. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
40. AWPA - American Wood Protection Association; [www.awpa.com](http://www.awpa.com).
41. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
42. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
43. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
44. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
45. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.org](http://www.bifma.org).
47. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); [www.bissc.org](http://www.bissc.org).
49. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
50. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
51. CEA - Consumer Electronics Association; [www.ce.org](http://www.ce.org).
52. CFFA - Chemical Fabrics and Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
53. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
54. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
55. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
56. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).

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57. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
58. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
59. CPA - Composite Panel Association; [www.pbmdf.com](http://www.pbmdf.com).
60. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
61. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).
62. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
63. CSA - Canadian Standards Association; [www.csa.ca](http://www.csa.ca).
64. CSA - CSA International; (Formerly: IAS - International Approval Services); [www.csa-international.org](http://www.csa-international.org).
65. CSI - Construction Specifications Institute (The); [www.csinet.org](http://www.csinet.org).
66. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.cti.org](http://www.cti.org).
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
70. DHI - Door and Hardware Institute; [www.dasma.com](http://www.dasma.com).
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; [www.eciaonline.org](http://www.eciaonline.org).
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
76. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
77. ESD - ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
80. FCI - Fluid Controls Institute; [www.fluidcontrolsinstitute.org](http://www.fluidcontrolsinstitute.org).
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); [www.fiba.com](http://www.fiba.com).
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); [www.fivb.org](http://www.fivb.org).
83. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
84. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; [www.floridarroof.com](http://www.floridarroof.com).
86. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
87. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
88. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
89. GANA - Glass Association of North America; [www.glasswebsite.com](http://www.glasswebsite.com).
90. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
91. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; [www.hpva.org](http://www.hpva.org).
95. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
96. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
97. IAS - International Accreditation Service; [www.iasonline.org](http://www.iasonline.org).
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).



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100. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
101. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
102. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
103. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
104. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
109. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).
110. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.okstate.edu](http://www.igshpa.okstate.edu).
111. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
116. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; [www.itu.int/home](http://www.itu.int/home).
119. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
122. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
123. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
124. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
125. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
126. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
127. MIA - Marble Institute of America; [www.marble-institute.com](http://www.marble-institute.com).
128. MMPA - Moulding & Millwork Producers Association; [www.wmmpa.com](http://www.wmmpa.com).
129. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
131. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
132. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
133. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
134. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
135. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
136. NBI - New Buildings Institute; [www.newbuildings.org](http://www.newbuildings.org).
137. NCAA - National Collegiate Athletic Association (The); [www.ncaa.org](http://www.ncaa.org).
138. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
139. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
140. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).

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141. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
142. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
143. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
144. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
145. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
148. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
149. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFPA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
152. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
153. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
154. NSF - NSF International; [www.nsf.org](http://www.nsf.org).
155. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
156. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
158. NWFPA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).
159. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
160. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
162. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
163. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
164. RIS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
165. SAE - SAE International; [www.sae.org](http://www.sae.org).
166. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
167. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
168. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
169. SEFA - Scientific Equipment and Furniture Association (The); [www.sefalabs.com](http://www.sefalabs.com).
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
172. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
173. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
175. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
176. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
177. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
178. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
179. SRCC - Solar Rating & Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
180. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
181. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
182. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
183. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
184. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).

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185. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
186. TCNA - Tile Council of North America, Inc.; [www.tileusa.com](http://www.tileusa.com).
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
190. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
191. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
192. TPI - Turfgrass Producers International; [www.turfgrasssod.org](http://www.turfgrasssod.org).
193. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
194. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
195. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
196. USAV - USA Volleyball; [www.usavolleyball.org](http://www.usavolleyball.org).
197. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
198. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).
199. WASTEC - Waste Equipment Technology Association; [www.wastec.org](http://www.wastec.org).
200. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
201. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
202. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
203. WI - Woodwork Institute; [www.wicnet.org](http://www.wicnet.org).
204. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
205. WWPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; [www.din.de](http://www.din.de).
2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
4. DOD - Department of Defense; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
7. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
8. FG - Federal Government Publications; [www.gpo.gov](http://www.gpo.gov).

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9. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
10. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; [www.eetd.lbl.gov](http://www.eetd.lbl.gov).
12. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
13. SD - Department of State; [www.state.gov](http://www.state.gov).
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; [www.trb.org](http://www.trb.org).
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
18. USP - U.S. Pharmacopeial Convention; [www.usp.org](http://www.usp.org).
19. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
  - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
  - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org/ccb](http://www.wbdg.org/ccb).
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; [www.bearhfti.ca.gov](http://www.bearhfti.ca.gov).

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2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.calregs.com](http://www.calregs.com).
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; [www.cal-iaq.org](http://www.cal-iaq.org).
5. CPUC; California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
6. SCAQMD; South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; [www.txforestservation.tamu.edu](http://www.txforestservation.tamu.edu).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES:

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS:

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

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1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
  2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
  3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- D. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
  2. HVAC system isolation schematic drawing.
  3. Location of proposed air-filtration system discharge.
  4. Waste handling procedures.
  5. Other dust-control measures.

1.5 QUALITY ASSURANCE:

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS:

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 8 feet (2.44 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.
  1. Accessories: UV-inhibited, screen fabric, woven polypropylene, taped hems, grommets at 2'-0" centers.

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- a. Color: Green.
  - b. Opacity: 96 percent.
- B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails. Provide concrete bases for supporting posts.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- D. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES:

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.3 EQUIPMENT:

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
- 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:



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- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

**3.2 TEMPORARY UTILITY INSTALLATION:**

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
  - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  - 1. Install electric power service overhead unless otherwise indicated.
  - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

**3.3 SUPPORT FACILITIES INSTALLATION:**

- A. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.
  - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.
- D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

**3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION:**

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  - 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings or requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

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1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
  2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
  3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
  4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install ribbon identification fencing located outside the drip line of trees to protect vegetation from damage from construction operations.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
1. Extent of Fence: As needed.
  2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
  3. Fence Height: 8'-0".
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.

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2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL:

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
  1. Protect porous materials from water damage.
  2. Protect stored and installed material from flowing or standing water.
  3. Keep porous and organic materials from coming into prolonged contact with concrete.
  4. Remove standing water from decks.
  5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
  1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  2. Keep interior spaces reasonably clean and protected from water damage.
  3. Periodically collect and remove waste containing cellulose or other organic matter.
  4. Discard or replace water-damaged material.
  5. Do not install material that is wet.
  6. Discard, replace, or clean stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
  1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use permanent HVAC system to control humidity.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

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- a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
- b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
- c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL:

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including Division 1 Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes:
  - 1. Procedures governing the selection of products.
  - 2. Procedures for delivery, storage and handling.
- B. Related Sections include the following:
  - 1. Division 01 Section "References" for applicable industry standards for products specified.
  - 2. Division 01 Section "Closeout Procedures" for submitting warranties for contract closeout.
  - 3. Division 02 through 48 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS:

- A. Definitions below are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties", "systems", "structure", "finishes", "accessories", and similar terms. Such terms such are self-explanatory and have well recognized meanings in the construction industry.
- B. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material", "equipment", "system", and terms of similar intent.
- C. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
- D. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
- E. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.
- F. Substitutions: Changes in products, materials, equipment, and methods of construction from

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those required by the Contract Documents and proposed by Contractor.

- G. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- H. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- I. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

**1.4 SUBMITTALS:**

- A. Product List Schedule:
  - 1. Prepare a schedule showing products specified in a tabular form acceptable to the Architect. Include generic names of products required.
  - 2. Form: Tabulate information for each product under the following column headings:
    - a. Specification Section number and title.
    - b. Generic name used in the Contract Documents.
    - c. Proprietary name, model number, and similar designations.
    - d. Manufacturer's name and address.
    - e. Supplier's name and address.
    - f. Installer's name and address.
    - g. Projected delivery date or time span of delivery period.
    - h. Identification of items that require early submittal approval for scheduled delivery date.
  - 3. Coordinate the product list schedule with the Contractor's Construction Schedule and the Schedule of Submittals.
  - 4. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.
  - 5. Completed Schedule: Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.
  - 6. Architect's Action: The Architect will respond in writing to the Contractor within 2 weeks of receipt of the completed product list schedule. No response within this time period constitutes no objection to listed manufacturers or products, but does not constitute a waiver of the requirement that products comply with Contract Documents.

**1.5 QUALITY ASSURANCE:**

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a

single source.

- B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

**1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:**

- A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft. Comply with manufacturer's written instructions.
- B. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
- C. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
- D. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
- E. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
- F. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
- G. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
- H. Store products, subject to damage by the elements, above ground and under cover, in a weathertight enclosure with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
- I. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
- J. Protect stored products from damage.

**1.7 PRODUCT WARRANTIES:**

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.



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- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
  3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

**PART 2 - PRODUCTS**

**2.1 PRODUCT SELECTION:**

- A. General Product Requirements:
1. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at the time of installation.
  2. Provide products complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
  3. Standard Products: Where available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  5. Where products are accompanied by the term "as selected," Architect will make selection.
  6. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  7. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
  8. Or Equal: Where products are specified by name and accompanied by the term "or equal", "or approved equal", "or approved" or "or as approved by the Architect," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Hazardous Materials:
1. All material and equipment furnished under the Contract shall be free of asbestos, lead and polychlorinated biphenyl (PCB). Any material or equipment containing these hazardous materials shall be considered defective and shall be removed by the Contractor at his own expense.

**2.2 PRODUCT SELECTION PROCEDURES:**

- A. Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience.
  
- B. Procedures governing product selection include the following:
  - 1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
  - 2. Semiproprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
  - 3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Section on Product Substitutions to obtain approval for use of an unnamed product.
  - 4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
  - 5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements which are recommended by the manufacturer for the application indicated.
    - a. General overall performance of a product is implied where the product is specified for a specific application.
    - b. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
  - 6. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
  - 7. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
    - a. If a satisfactory match cannot be made with specified products, comply with provisions of the Contract Documents concerning substitutions to select a matching product in another product category.
  - 8. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.
    - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.

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- b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
- 9. Allowances: Refer to individual Specification Sections and provisions in Division 1 for allowances that control product selection, and for procedures required for processing such selections.

**2.3 COMPARABLE PRODUCTS:**

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
  - 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

**PART 3 - EXECUTION**

**3.1 INSTALLATION OF PRODUCTS:**

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated.
- B. Anchor each product securely in place, accurately located and aligned with other work.
- C. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016000

SECTION 016200

INSTALLATION STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including terms and conditions, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes:
  - 1. General provisions, standards, and tolerances which apply to the Work of this Contract in the absence of stricter specified standards and tolerances.

1.3 LEVELING:

- A. Place work in correct position and, unless specifically called for otherwise, build and install parts of the work level, plumb, and square.
- B. No part shall be out of plumb, level, square, or correct position so much as to impair its function or the function of any part of the Project.
- C. No part shall be out of plumb, level, square, or correct position so much as to impair the aesthetic effect of the part or its effect on the Project as judged by the Architect.

1.4 JOINTS:

- A. Make joints tight and neat. If such is impossible, apply moldings, sealant, or other closure as directed by Architect.
- B. Allow for expansion and contraction.

1.5 FASTENERS:

- A. Under potentially damp conditions, provide galvanic insulation between different metals which are not adjacent on the galvanic scale.
  - 1. Fasteners for carpentry in potentially damp locations shall be stainless steel, aluminum, or hot dip galvanized steel.
  - 2. Fasteners for copper and brass in all locations and under all conditions shall be copper or brass.
  - 3. Fasteners for stainless steel shall be stainless steel.
  - 4. Fasteners for aluminum shall be stainless steel or aluminum.
  - 5. Fasteners for ferrous metals shall be galvanized or stainless steel.
- B. Fasteners on the exterior of a building, in cellars and crawl spaces, and other areas where dampness and corrosion can reasonably be anticipated, shall be one of the types specified above compatible with the materials involved.

**1.6 PROTECTIVE FINISHES:**

- A. Before installation, apply protective finish to items which are to be concealed. For example, paint corrodible mounting plates before installing parts over them.
- B. Paint aluminum embedded in masonry with bituminous paint.
- C. Coat concealed wood exposed to dampness with heavy coat of water repellent-toxic fungicide.
- D. Paint other concealed materials with same primer and finish specified for exposed surfaces. If concealed materials are fully covered, primer alone is sufficient.
- E. Concealed parts which are already corrosion protected need not be painted unless specified otherwise.

**1.7 BLOCKING AND BRACING:**

- A. Provide adequate blocking, bracing, nailers and fastenings to install the parts of the work securely. Installed parts shall, in general, be able to withstand 2 1/2 times the maximum anticipated load.
- B. Provide blocking, bracing, nailers, and fastenings which will not be subject to deterioration or weakening as the result of normal environmental conditions or ageing.

**1.8 SUPPORTING BASES:**

- A. Check Drawings, equipment details, and specifications for the requirements for bases, pads, and similar supporting structures.
- B. Provide such supporting structures whether or not shown on Drawings.

**1.9 CRACKS:**

- A. As part of the requirements for correction of work, repair cracks and other faults which occur as a result of settlement and shrinkage.
- B. Seal cracks and openings to make exterior of building weather tight.
- C. Fit materials tight to penetrations through wall and floor systems. Provide fire-stopping at rated systems to meet ratings noted on Drawings.

**1.10 INSTALLATION OF MATERIALS:**

- A. Inspect each product upon delivery and again immediately before installation. Do not install damaged or defective products, materials, or equipment.
- B. For each unit of work, examine substrate conditions before beginning installation. Correct unsatisfactory conditions before work proceeds.
- C. Mount individual units of work at industry-recognized mounting heights if not otherwise indicated. Refer uncertainties to Architect for resolution.
- D. Anchor work securely in place. Locate by measured line and level, organize for uniformity, visual effect, operational efficiency, durability, and similar benefit to Owner's use, and Architect's approval.

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- E. Provide all required accessories for the proper installation, use, and service of each part of work.
- F. Secure work in place with positive anchorage designed and sized to withstand stress including vibration and racking.
- G. Adjust and operate all items of equipment leaving them fully ready for use.

1.11 REPAIR AND RESTORATION:

- A. Replace work which, because of construction activity, becomes unfit for use or unsightly.
- B. Promptly replace material and equipment damaged in construction activity.
- C. Restore finishes which are damaged, soiled, or otherwise made unsightly during construction.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 016200

SECTION 017300

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. General installation of products.
  - 4. Progress cleaning.
  - 5. Starting and adjusting.
  - 6. Protection of installed construction.
  - 7. Correction of the Work.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for limits on use of Project site.
  - 2. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 SUBMITTALS

- A. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  - 2. Furnish location data for work related to Project that must be performed by public utilities

serving Project site.

- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 3. Inform installers of lines and levels to which they must comply.
  - 4. Check the location, level and plumb, of every major element as the Work progresses.
  - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available



for reference by Architect.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper

operation.

- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

### 3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including terms and conditions, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
  - 1. Division 07 Section "Penetration Firestopping" for patching fire-rated construction.
  - 2. Division 07 Section "Joint Firestopping" for patching head-of-wall and perimeter-floor-to-curtain wall joints.
  - 3. Divisions 2 through 26 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
    - a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 22, 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 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.

1.4 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. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
  - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
  - 7. Contractor's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE:

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
  - a. Foundation construction
  - b. Bearing and retaining walls
  - c. Structural concrete
  - d. Structural steel
  - e. Lintels
  - f. Timber and primary wood framing
  - g. Structural decking
  - h. Stair systems
  - i. Miscellaneous structural metals
  - j. Exterior curtain wall construction
  - k. Equipment supports
  - l. Piping, ductwork, vessels and equipment
  - m. Structural systems of special construction
  
- B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  - 1. Primary operational systems and equipment.
  - 2. Air or smoke barriers.
  - 3. Fire-protection systems.
  - 4. Control systems.
  - 5. Communication systems.
  - 6. Conveying systems.
  - 7. Electrical wiring systems.
  - 8. Operating systems of special construction in Division 13 Sections.
  
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
  - 1. Water, moisture, or vapor barriers.
  - 2. Membranes and flashings.
  - 3. Exterior curtain-wall construction.
  - 4. Equipment supports.
  - 5. Piping, ductwork, vessels, and equipment.
  - 6. Noise- and vibration-control elements and systems.
  
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
  
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS

2.1 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.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION:

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

3.2 PREPARATION:

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect 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.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE:

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut 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. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

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3. Concrete, Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections 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 retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

SEND OF SECTION 017329

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
1. Inspection procedures.
  2. Warranties.
  3. Final cleaning.
- B. Related Sections include the following:
1. Division 01 Section "Project Management and Coordination" for progress cleaning of Project site.
  2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
  5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION:

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  2. Advise Owner of pending insurance changeover requirements.
  3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.



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7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify the General Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify the General Contractor of items, either on General Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION:

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Consent of surety to final payment.
6. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

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- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify the General Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify the General Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. The Architect will invoice the Owner for services performed in inspections beyond the original inspection and the first reinspection. The Owner will, in turn, pass this cost on to the General Contractor and require a "deduct" Change Order due to the Owner.

**1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST):**

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by General Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
  2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of General Contractor.
    - e. Name of Construction Manager.
    - f. Page number.
  4. Submit list of incomplete items in the following format:
    - a. MS Excel electronic file. Architect will return annotated file.

**1.6 WARRANTIES:**

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with the General Contractor.

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- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of General Contractor.
  4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

**PART 2 - PRODUCTS**

**2.1 MATERIALS:**

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

**PART 3 - EXECUTION**

**3.1 FINAL CLEANING:**

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
1. Sweep, dust, wash, and polish all finished surfaces. This includes cleaning of the Work of all finished trades where needed, whether or not cleaning for such trades is included in their respective Sections.
  2. Each Subcontractor for mechanical and electrical work, including Plumbing, HVAC, Fire Protection, and Electrical Work shall clean materials and equipment for which they are responsible, leaving the Work in a finished and clean state.
  3. Final cleaning shall be performed for each phase as they are completed.

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- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.
    - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - n. Replace parts subject to unusual operating conditions.
    - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    - q. Clean ducts, blowers, and coils if units were operated without filters during construction.

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- r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Product maintenance manuals.
  - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS:

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS:

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

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- B. Format: Submit operations and maintenance manuals in the following format:
1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.
  2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

**PART 2 - PRODUCTS**

**2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY:**

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
  2. List of systems.
  3. List of equipment.
  4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

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- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

**2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS:**

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Construction Manager.
  6. Name and contact information for Contractor.
  7. Name and contact information for Architect.
  8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  9. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.



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2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
  - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
  - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS:

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

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- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

2.4 OPERATION MANUALS:

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.

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3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS:

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

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1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.
  3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

**2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS:**

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.

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- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

**PART 3 - EXECUTION**

**3.1 MANUAL PREPARATION:**

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

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- E. **Manufacturers' Data:** Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  
- F. **Drawings:** Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of operation and maintenance manuals.
  - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
  
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
1. Record Drawings.
  2. Record Specifications.
  3. Record Product Data.
  4. Miscellaneous record submittals.
  5. Data Retrieval Sheets.
- B. Related Sections include the following:
1. Division 01 Section "Closeout Procedures" for general closeout procedures.
  2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of products in those Sections.

1.3 CLOSEOUT SUBMITTALS:

- A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit one paper-copy set(s) of marked-up record prints.
      - 2) Submit PDF electronic files of scanned record prints and one of file prints.
      - 3) Submit record digital data files and one set(s) of plots.
      - 4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
      - 2) Print each drawing, whether or not changes and additional information were recorded.
      - 3) Submit record digital data files and three set(s) of record digital data file plots.

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- 4) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one paper copy, and one copy of annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
  - C. Record Product Data: Submit one paper copy, and one copy of annotated PDF electronic files and directories of each submittal.
    1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
  - D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy, and one copy of annotated PDF electronic files and directories of each submittal.
  - E. Data Retrieval Sheets: Submit one paper copy and one electronic copy of Data Retrieval Sheets.

**PART 2 - PRODUCTS**

**2.1 RECORD DRAWINGS:**

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
  2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.



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- i. Locations of concealed internal utilities.
  - j. Changes made by Change Order or Construction Change Directive.
  - k. Changes made following Architect's written orders.
  - l. Details not on the original Contract Drawings.
  - m. Field records for variable and concealed conditions.
  - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Before completion of the Work, and when directed by the Architect, the Construction Manager and all indicated subcontractors shall perform the following:
1. Transcribe all previously recorded information from Record Prints onto the electronic files.
  2. Make all final changes and corrections to the electronic files for the Final Record Drawings.
  3. Signatures Required: The Construction Manager and Sub-Contractor shall sign each drawing for which they are responsible, as certification that the work was installed as shown.
  4. Deliver signed, completed Final Record Drawings to Architect.
- C. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Owner's Project Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
  2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Architect for resolution.
  4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
    - a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
    - b. Architect will provide data file layer information. Record markups in separate layers.
- D. Format: Identify and date each Record Drawing; include the designation "**PROJECT RECORD DRAWING**" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

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2. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "**PROJECT RECORD DRAWINGS.**"
  - d. Name of Architect.
  - e. Name of Construction Manager.

2.2 RECORD SPECIFICATIONS:

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of the manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders, Record Drawings, and Product Data where applicable.
  6. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA:

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, Record Drawings, and Product Data where applicable.
  4. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.
  5. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS:

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
  1. Include miscellaneous record submittals directory organized by Specification Section

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number and title, electronically linked to each item of miscellaneous record submittals.

**PART 3 - EXECUTION**

**3.1 RECORDING AND MAINTENANCE:**

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
  
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Owner's Project Manager's reference during normal working hours.

END OF SECTION 017839

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including terms and conditions, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Sections include the following:
  - 1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.

1.3 SUBMITTALS:

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. At completion of training, submit one complete training manual for Owner's use.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE:

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

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- C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

**1.5 COORDINATION:**

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

**PART 2 - PRODUCTS**

**2.1 INSTRUCTION PROGRAM:**

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Equipment, including stage equipment, projection screens, loading dock equipment and laboratory fume hoods.
  - 2. Fire-protection systems, including fire alarm and fire-extinguishing systems.
  - 3. Intrusion detection systems.
  - 4. Laboratory equipment, including laboratory gas, equipment and piping.
  - 5. Heat generation, including boilers, feedwater equipment, pumps and water distribution piping.
  - 6. Refrigeration systems, including condensers, pumps and distribution piping.
  - 7. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
  - 8. HVAC instrumentation and controls.
  - 9. Electrical service and distribution, including transformers, switchboards, panelboards and motor controls.
  - 10. Lighting equipment and controls.
  - 11. Communication systems, including intercommunication, surveillance, clocks and programming equipment.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.

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- c. Operating standards.
  - d. Regulatory requirements.
  - e. Equipment function.
  - f. Operating characteristics.
  - g. Limiting conditions.
  - h. Performance curves.
2. Documentation: Review the following items in detail:
- a. Emergency manuals.
  - b. Operations manuals.
  - c. Maintenance manuals.
  - d. Project Record Documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
  - b. Test and inspection procedures.

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7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
  
8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

**PART 3 - EXECUTION**

**3.1 PREPARATION:**

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
  
- B. Set up instructional equipment at instruction location.

**3.2 INSTRUCTION:**

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  1. Schedule training with Owner, with at least seven days' advance notice.
  
- C. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
  
- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

SECTION 024199

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including terms and conditions, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Demolition and removal of selected elements.
  - 2. Salvage of existing items to be reused or recycled.
- B. Related Sections include the following:
  - 1. Division 01 Section "Cutting and Patching" for cutting and patching procedures.

1.3 DEFINITIONS:

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

1.4 MATERIALS OWNERSHIP:

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 SUBMITTALS:

- A. Qualification Data: For demolition firm, professional engineer, and refrigerant recovery technician.
- B. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.



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- C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

1.6 QUALITY ASSURANCE:

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
- E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 5. Review areas where existing construction is to remain and requires protection.

1.7 PROJECT CONDITIONS:

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
  - 1. Comply with requirements specified in Division 1 Section "Summary."
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
  - 1. Hazardous materials will be removed by Owner under a separate contract.
  - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Construction Manager.
  - 3. Construction Manager will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.
- E. Storage or sale of removed items or materials on-site is not permitted.

- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY:

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION:

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

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS:

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
  - 1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section "Summary."

3.3 PREPARATION:

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section "Temporary Facilities and Controls."

- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

- 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL:

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

- 1. Dispose of demolished items and materials promptly.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS:

- A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

3.6 DISPOSAL OF DEMOLISHED MATERIALS:

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

- 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

- B. Burning: Do not burn demolished materials.

- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING:

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024199

SECTION 031000

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section includes formwork for cast-in-place concrete, including water stops, and installation of embedded items.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Reinforcement - Section 03 20 00
- B. Cast-In-Place Concrete - Section 03 30 00
- C. Under-Slab Vapor Retarder – Section 07 26 00

1.3 QUALITY ASSURANCE

- A. Comply with the American Concrete Institute Standard, ACI 347-04, Recommended Practice for Concrete Formwork.

1.4 REFERENCE STANDARDS, latest editions of the following:

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM D 226 Specification for Asphalt - Saturated Organic Felt used in Roofing and Waterproofing"
  - 2. ASTM D 1751 Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood complying with Voluntary Product Standard PS 1-07 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better or metal, metal-framed plywood or other acceptable panel-type materials. Plywood shall be mill-oiled and edge-sealed, with each piece bearing legible inspection trademark. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
- B. Forms for Unexposed Finish Concrete: Use plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

- C. Form Coatings: Commercial formulation that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
  - D. Chamfer Strips:  $\frac{3}{4}$  inch by  $\frac{3}{4}$  inch wood, PVC, or rubber.
  - E. Preformed Construction Joint: 24-gage steel, galvanized, shaped to form a continuous tongue and groove key.
  - F. Preformed Control Joint: Rigid plastic or metal strip with removable top section.
  - G. Expansion Joint Material: Asphalt saturated fiberboard,  $\frac{1}{2}$  inch thick, meeting the requirements of ASTM D 1751.
  - H. Felt: Asphalt-saturated organic felt, weighing 30 pounds per 100 square feet, meeting the requirements of ASTM D 226.
  - I. Water stops: PVC, meeting the requirements of CRD-C572. Provide 6 inches wide dumbbell shape water stop with  $\frac{3}{16}$ -inch minimum web thickness and  $\frac{3}{8}$  inch minimum end bulb diameter.
- OR
- J. Water stops: Volclay RX manufactured by Colloid Environmental Technologies Co. (CETCO).
  - K. Recycled Content: Minimum 5 percent post-consumer content, or minimum 20 percent pre-consumer recycled content at contractor's option.

### PART 3 - EXECUTION

#### 3.1 COORDINATION

- A. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel. Set screeds accurately. Embedded items shall be accurately aligned and adequately supported. Verify installation of mechanical, plumbing, and electrical items to be embedded in concrete. Correct any unsatisfactory condition before proceeding further.

#### 3.2 PREPARATION

- A. Form Coating: Coat contact surfaces of forms with a form coating compound before reinforcement is placed. Thin form-coating compounds with thinning agent and apply as specified in manufacturer's instructions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed.

#### 3.3 INSTALLATION

- A. Formwork: Formwork shall support vertical and lateral loads that are applied until such loads can be supported by concrete structure. Formwork shall be readily removable without impact,

shock or damage to cast-in-place concrete surfaces and adjacent materials. Construct forms to sizes, shapes, lines and dimensions shown. Perform surveys to obtain accurate alignment. Provide for recesses, chamfers, blocking, anchorages, inserts, and other features required in work. Select materials to obtain required finishes. Butt joints solidly and provide backup at joints to prevent leakage of cement paste.

- B. Chamfer Strips: Provide at exposed corners and edges.
- C. Form Ties: Use factory fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal.
- D. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

### 3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set anchorage devices and other embedded items accurately. Use setting drawings, diagrams, templates and printed instructions provided by supplier. Secure embedded items such that they are not displaced during placement of concrete.
- B. Water stops: Install according to manufacturers printed instructions. Splice water stop sections using square cut butt joints and fuse sections together with indirect heat from preheated splicing iron. Use of direct flame is prohibited.
  - 1. Place water stops in all concrete construction joints in basement walls around the building perimeter that are exposed to soil, weather, or moisture, and in any other construction joints that have the potential to allow water infiltration into the building.

### 3.5 JOINTS

- A. Construction Joints in Elevated Slabs and Beams: Construction joints in Elevated Slabs, Beams, Grade Beams, and other flexural members shall only be made as shown in the contract drawings or as approved by the Engineer of Record. Joints shall be constructed in accordance with ACI 318 Section 6.4 with provisions made for the transfer of shear and other forces. Reinforcement shall be continuous through these joints unless noted otherwise.
- B. Construction Joints in Walls, Foundations, and Slabs on Grade: Provide keyways at least 1 ½ inches deep in vertical construction joints in walls and construction joints in slabs on grade and foundations. Discontinue every other horizontal bar through slab on grade construction joints unless noted otherwise.
- C. Preformed Construction Joint for Slabs on Grade: Secure with galvanized steel stakes, 1/8 inch thick by 1-1/8 inches wide with ½ inch deep rib and tapered point. Splice adjoining joints with 24 gage steel, galvanized splice plates.
- D. Isolation Joints in Slabs on Grade: Construct isolation joints in interior slabs using 30 lb. felt. Provide isolation joints at points of contact between slabs on grade and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated. Construct

isolation joints on exterior slabs abutting vertical surfaces with ½ inch thick expansion joint material.

E. Control Joints in Slabs-on-Grade:

1. Preformed Strip: Insert premolded rigid plastic, or metal strip into fresh concrete. Cut groove for strip using 10-foot long straight edge cutting tool. Depths of strip shall be one fourth of slab thickness. Press strip into groove such that top of strip is level with the concrete surface. Pull off removable top section, if any, prior to troweling.
2. Saw Cut: Contractor may saw cut control joints instead of using preformed strips. Saw cut joints shall be 1/8 inch wide. Saw cut depth should equal 1/4 of slab depth. Cut joints after concrete has hardened sufficiently to prevent raveling; usually 4 to 12 hours after slab has been cast and finished. Use diamond or silicone-carbide blades.

F. Control Joints in Walls: Create weakened planes in cantilevered retaining walls at 25 feet on center. Use preformed strips, placed vertically, full height in each face of wall. Depth of strips shall be one inch.

3.6 REMOVAL OF FORMWORK

- A. General: Prevent excessive deflection, distortion, and damage to concrete when forms are stripped. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
- B. Formwork and supports at sides of concrete shall remain in place for 24 hours after concrete placement. This period represents cumulative number of hours, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 degrees F. Formwork and shoring which support the weight of concrete shall not be removed until concrete has attained its specified compressive strength.
- C. Ensure safety of the structure. Do not superimpose any load on concrete until forms are removed and concrete is cured.

3.7 RE-USE OF FORMS

- A. General: Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

When forms are intended for successive concrete placement, thoroughly clean surfaces and remove fins and latence. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

END OF SECTION 031000

SECTION 050513

SHOP-APPLIED COATINGS FOR METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section specifies hot-dip galvanizing and shop-applied primer coat for metal fabrications including, but not limited to exterior structural steel, exterior loose steel lintels, railings and pipe rail.
- B. Related Sections include the following:
  - 1. Section 055213 "Pipe and Tube Railings" for the shop priming of steel railings.
  - 2. Section 05500 "Metal Fabrications" for the shop priming of miscellaneous steel fabrications.

1.3 REFERENCE STANDARDS:

- A. Comply with applicable portions of the following reference standards:
  - 1. ASTM A 123: Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
  - 2. ASTM A 143: Safeguarding Against Embrittlement.
  - 3. ASTM A 153: Standard Specification for Zinc (Hot Dip Galvanizing) on Iron and Steel Hardware.
  - 4. ASTM A 384: Safeguarding Against Warpage.
  - 5. ASTM A 385: Providing High Quality Zinc Coatings.
  - 6. ASTM A 780: Repair of Hot Dip Galvanizing.

1.4 SUBMITTALS:

- A. Samples: Submit two 3 inch by 6 inch samples of shop-applied coatings and colors proposed for use for approval prior to coating application.
  - 1. Verification Sample: Provide verification sample to Architect for approval of surface texture and color prior to full fabrication and production. Direct fabricator to provide galvanizer with sample of actual material to receive hot-dip galvanizing and shop applied finish coating. Direct galvanizer to hot-dip galvanize and finish sample in selected color



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- B. Certificate of Compliance from Galvanizer: Submit notarized Certificate of Compliance with application for payment for galvanizing, signed by galvanizer, indicating compliance with requirements of specifications. Include scope of services provided, and quantity and itemized description of items processed.
- C. Visual Stamp: The galvanizer shall mark all lots of material with a clearly visible stamp or tag indicating the name of the galvanizer, the weight of the coating, and the applicable ASTM Specification Numbers.

**1.5 QUALITY ASSURANCE:**

- A. Pre-Construction Conference for Metal Fabrications: Contractor shall schedule a meeting to be attended by Contractor, Owner's Representative, fabricator, and galvanizer. Agenda shall include the following: Project schedule, scope of metal fabrications, coordination between fabricator and galvanizer, finish of surfaces, application of coatings, submittals, color matching, and approvals.
- B. Coordination Between Fabricator and Galvanizer: Prior to fabrication, direct fabricator to submit approved shop drawings to the galvanizer for all fabrications. Direct galvanizer to review fabricator's shop drawings for suitability of materials for galvanizing and coatings and coordinate any required modifications to fabrications required to be done by the fabricator.
- C. Steel Materials: For steel to be hot dip-galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: Carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.
  - 1. To prevent unnecessary damage to the galvanized coating by field welding, provide slip-fit method of connecting pipe railings. Fabricate pipe railing from mechanical steel tubing internally vented with holes  $\frac{3}{4}$  the size of the pipe's internal diameter. For other fabrications, bolted connections shall be used wherever possible.
  - 2. Assemblies: Where size of assembly is too large for galvanizing kettle, galvanize components prior to fabrication and assemble after galvanizing.
- D. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coatings within the same facility as outlined herein. The Architect has the right to inspect and approve or reject the galvanizer/galvanizing facility.
- E. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program acceptable to the Architect which has been in effect for a minimum of five years and shall provide the Architect with process and final inspection documentation.
- F. The galvanizer/galvanizing facility must have an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.

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- G. In-process paint application shall be monitored with a wet film gage and the measurements recorded. Dry film thickness measurement shall be by Tooke Gage and Magnetic Coating Thickness gage.
- H. Provide and apply materials complying with environmental requirements of authority having jurisdiction. All materials shall be delivered to the galvanizer with label or product data sheet affixed to the manufacturer's containers showing the manufacturer's name, batch number, type of paint, stock number, label analysis of solids and vehicle, reducing and thinning instructions, drying and recoat time, MSDS sheets, recommended application procedures and environmental restrictions. Paint materials shall be stored in an accepted location reserved only for such materials and related equipment in compliance with applicable local health and fire regulations and OSHA requirements.
- I. The galvanizer/galvanizing facility must have a dedicated, on-premise painting and curing facility for the exclusive use of coating galvanized steel. Said facility shall utilize the following:
  - 1. Recording hygrometer to measure air temperature and humidity.
  - 2. A spray booth conforming to OSHA regulations with filtered exhaust.
  - 3. A convection hot air curing system with solvent vapor removal ability.
  - 4. The curing booth shall be heated using an indirect thermostat controlled gas fired forced hot air blower. The booth shall be protected with a sprinkler system complying with NFPA 15. The air in the curing booth shall be continuously monitored by a lower explosive limit (LEL) monitoring device connected to the ventilation system. The booth shall be capable of reaching 150° F with a sustained capability of 100° F.

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE SYSTEMS:**

- A. Fabricators: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. AZZ Galvanizing, Tulsa, OK, (918) 584-0303
  - 2. North American Galvanizing Co., Tulsa, OK (918) 488-9420.
  - 3. Valmont Coating, Claremore. OK, (918) 266-2800.

**2.2 HOT-DIP GALVANIZING AND FACTORY-APPLIED PRIMER:**

- A. Hot-Dip Galvanizing: For exterior steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process.
  - 1. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware.
  - 2. Provide thickness of galvanizing specified in referenced standards.
  - 3. Galvanizing bath shall contain special high grade zinc and other earthly materials.
  - 4. Fill vent holes after galvanizing, if applicable, and grind smooth.

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- B. Factory-Applied Primer over Galvanized Steel: Provide factory-applied prime coat, certified OTC/VOC compliant less than 2.8 lbs/gal. and conforming to EPA and local requirements. Apply primer within 12 hours after galvanizing at the same galvanizer's plant in a controlled environment meeting applicable environmental regulations and as recommended by the primer coating manufacturer. Primer coat shall exhibit a rugosity (smoothness) not greater than 4 rug (16-20 microns of variation) when measured by a profilometer over a 1 inch straight line on the surface of architectural and structural elements that are less than 24 pounds per running foot. Profilometer shall be capable of operating in 1 micron increments. Blast cleaning of the surface is unacceptable for surface preparation. Primer shall have a minimum two year re-coat window for application of finish coat. Coatings must meet or exceed the following performance criteria as stipulated by the coatings manufacturer:
1. Abrasion Resistance: ASTM D 4060 (CS17 Wheel, 1,000 grams load). 1kg load, 200 mg loss.
  2. Adhesion: ASTM D4541, 1050 psi.
  3. Corrosion Weathering: ASTM D5894, 13 cycles, 4,368 hours; rating 10 per ASTM D714 for blistering and rating 7 per ASTM D610 for rusting.
  4. Direct Impact Resistance: ASTM D2794, 160 in. lbs.
  5. Flexibility: Method: ASTM D522, 180 degree bend, 1 inch mandrel, passes.
  6. Pencil Hardness: ASTM D3363, 3B.
  7. Moisture Condensation Resistance: ASTM D4585, 100 degrees F, 2000 hours; passes, no cracking or delamination.
  8. Dry Heat Resistance: Method: ASTM D2485, 250 degrees F.
  9. Warranty: Provide galvanizer's warranty that materials will be free from 10 percent or more visible rust for a period of 20 years.

**PART 3 - EXECUTION**

**3.1 APPLICATION OF GALVANIZING AND METAL COATINGS:**

- A. Galvanize materials in accordance with referenced standards and this specification.
- B. Galvanizing shall provide an acceptable substrate for applied coatings.
- C. The dry kettle process shall be used to eliminate any flux inclusions on the surface of the galvanized material. Prior to galvanizing, the steel shall be immersed in a pre flux solution (zinc ammonium chloride). The pre flux tank must be 12° to 14° Baumé and contain less than 0.4% iron. The wet kettle process shall be prohibited.
- D. To provide the galvanized surface required, the following procedures shall be implemented:
  1. A monitoring recorder shall be utilized and inspected regularly to observe any variances in the galvanizing bath temperature.
  2. The pickling tanks shall contain hydrochloric acid with a constant range between 10-14%, iron content less than 8% and zinc content less than 3%. Titrations shall be taken

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- weekly at a minimum.
3. Rinse tanks, for the removal of cleaning chemicals, shall contain water.
  4. Water quenching of galvanized steel shall be prohibited.
- E. The primer material shall be certified VOC compliant < 2.9 lbs/gal., and conform to the following: and conform to all environmental and EPA standards and requirements.
1. The primer shall be a high solid polyamide epoxy applied to a DFT of 3 mils minimum.
- F. Apply primer over hot-dip galvanizing within 12 hours after galvanizing in the galvanizer's facility in accordance with specified requirements and recommendations of galvanizer.
- G. The primer shall be applied under the following conditions:
1. Minimum air temperature shall be 65° F. Surface temperature of steel shall be 60°-95° F and, in any event, be 5° F higher than the dew point. Humidity shall be 85% maximum.
  2. Surface of steel shall be dry and free from dust, dirt, oil, grease or other contaminants. Coating and cure facility shall be maintained free of airborne dust and dirt until coatings are completely cured.
  3. The primer shall be applied by way of airless spray over a consistent surface profile, 1.5 mil minimum. The profile shall be measured and permanently recorded with Test- Tex tape.
  4. The use of iron or steel shot and sand and aluminum oxide grit as a blast medium, and power wire brushes are not permitted.
- H. Installation: Comply with fabricator's and galvanizer's requirements for installation of materials and fabrications, including use of nylon slings or padded cables for handling shop-primed or shop-finished materials.
- I. Touch-Up and Repair: For damaged and field-welded metal coated surfaces, clean welds, bolted connections and abraded areas.
1. At galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A 780. Galvanizing repair paint shall have 95 percent zinc by weight, ZRC Cold Galvanizing Compound. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A 123 or A 153 as applicable. Touch-up of galvanized surfaces with aerosol spray, silver paint, bright paint, brite paint, or aluminum paints is not acceptable.
  2. At shop-primed or shop-finished surfaces, touch-up finish in conformance with manufacturer's recommendations. Provide touch-up such that repair is not visible from a distance of 6 feet.
  3. The galvanizer/galvanizing facility must have an ongoing touch-up and repair program acceptable to the Architect which has been in effect for a minimum of five years.
  4. Provide a touch up repair kit.

END OF SECTION 050513

SECTION 054000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Exterior non-load-bearing wall framing.
- B. Related Sections include the following:
  - 1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
  - 2. Division 06 "Sheathing" for glass mat gypsum sheathing attached to steel wall framing.
  - 3. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.

1.3 DEFINITIONS:

- A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.
- B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.4 PERFORMANCE REQUIREMENTS:

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As indicated on Structural Drawings.
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Non-Load-Bearing Wall Framing (at stone veneer): Horizontal deflection of 1/600 of the wall height.
    - b. Exterior Non-Load-Bearing Framing (at plaster): Horizontal deflection of 1/360 of the wall height.
  - 3. Design framing systems to provide for movement of framing members without damage or over stressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

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4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
  - a. Upward and downward movement of ½ inch.
- B. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
  1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
  2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

**1.5 SUBMITTALS:**

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.
  1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
  1. Expansion anchors.
  2. Power-actuated anchors.
  3. Mechanical fasteners.
  4. Vertical deflection clips.
  5. Miscellaneous structural clips and accessories.
  6. Steel sheet.
- G. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having

jurisdiction.

1.6 QUALITY ASSURANCE:

- A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- D. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.
- E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- F. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- G. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
- H. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" or "Load and Resistance Factor Design Specification for Cold-Formed Steel Structural Members" and the following for calculating structural characteristics of cold-formed metal framing:
  - 1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING:

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery,

storage, and handling.

- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
  - 1. Allied American Studco, Inc.
  - 2. Clark Steel Framing Industries.
  - 3. Consolidated Fabricators Corp.
  - 4. Consolidated Systems, Inc.
  - 5. Dale Industries, Inc.
  - 6. Design Shapes in Steel.
  - 7. Dietrich Industries, Inc.
  - 8. Knorr Steel Framing Systems.
  - 9. MarinoWare; a division of Ware Industries.
  - 10. Scafco Corp.
  - 11. Steel Construction Systems.
  - 12. Steel Developers, LLC.
  - 13. Steeler, Inc.
  - 14. Super Stud Building Products, Inc.
  - 15. Unimast, Inc.
  - 16. United Metal Products, Inc.

### 2.2 MATERIALS:

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Steel Sheet: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
  - 1. Grade: 33, and as required by structural performance.
  - 2. Coating: G90.

### 2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING:

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:
  - 1. Minimum Uncoated-Steel Thickness: 0.0538 inch (1.37 mm) 16 gauge.
  - 2. Flange Width: 1-5/8 inches, minimum.



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- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, complying with ASTM C 955, and as follows:
  - 1. Minimum Uncoated-Steel Thickness: 0.0538 inch (1.37 mm) 16 gauge.
  - 2. Flange Width: 1-1/4 inches.
  
- C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure.
  - 1. Maintain 3/4-inch deflection gap between top of stud and deflection track.

2.4 FRAMING ACCESSORIES:

- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.
  
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  - 1. Supplementary framing.
  - 2. Bracing, bridging, and solid blocking.
  - 3. Web stiffeners.
  - 4. End clips.
  - 5. Foundation clips.
  - 6. Gusset plates.
  - 7. Stud kickers, knee braces, and girts.
  - 8. Joist hangers and end closures.
  - 9. Hole reinforcing plates.
  - 10. Backer plates.
  - 11. Deflection tracks.
  - 12. Slide clips.

2.5 ANCHORS, CLIPS, AND FASTENERS:

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.
  - 1. Slide Clips: WSC Slide Clips, 16 gage minimum, Marinoware.
  - 2. Support Clips: EASYCLIP E-Series Support Clip, 16 gage minimum, standoff for rigid connections; ClarkDietrich Building Systems.
  
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
  
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

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- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS:

- A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- B. Galvanizing Repair Paint: SSPC-Paint 20.

2.7 FABRICATION:

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  - 4. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
  - 5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing

- or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION:

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION:

- A. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

#### 3.3 INSTALLATION, GENERAL:

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
  1. Cut framing members by sawing or shearing; do not torch cut.
  2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
- E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity

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to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

**3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION:**

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: 16 inches (406 mm), and as indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. Install single-leg deflection tracks and anchor to building structure.
  - 2. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches ( (1220 mm)) apart. Fasten at each stud intersection.
  - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.
- G. Top Bridging for Single Deflection Track: Install horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness

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indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten straps to stud flange and secure solid blocking to stud webs or flanges. Provide one of the following methods.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL:

- A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.
- B. Field and shop welds will be subject to inspection and testing.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace Work that does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.6 REPAIRS AND PROTECTION:

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:

1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
2. Loose bearing and leveling plates.
3. Metal ladders.
4. Ladder safety cages.
5. Metal bollards.
6. Metal stair treads for exterior cast-in-place concrete stairs.
7. Steel shapes for supporting elevator door sills.
8. Elevator pit sump covers.

- B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Bearing plates, inserts and other incidental items of structural or miscellaneous steel where shown in the Drawings and/ or required to be built into concrete, masonry or other construction.
3. All miscellaneous steel members supporting penetrations of roof, floor or wall openings larger than 18-inches square.

- C. Related Sections include the following:

1. Division 03 Section "Cast-In-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 05 Section "Shop-Applied Coatings for Metal" for galvanizing and shop priming exterior ladders and bollards.
3. Division 05 Section "Structural Steel."
4. Division 05 Section "Pipe and Tube Railings."
5. Division 06 Section "Miscellaneous Rough Carpentry" for metal framing anchors.

1.3 PERFORMANCE REQUIREMENTS:

- A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F(67 deg C), ambient; 180 deg F(100 deg C), material surfaces.

- C. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

**1.4 SUBMITTALS:**

- A. Product Data: For the following:
  - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
  - 2. Metal nosings.
  - 3. Paint products.
  - 4. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
  - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
  - 2. Provide templates for anchors and bolts specified for installation under other Sections.
  - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For professional engineer.
- E. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

**1.5 QUALITY ASSURANCE:**

- A. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."
  - 3. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

**1.6 PROJECT CONDITIONS:**

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
  - 2. Provide allowance for trimming and fitting at site.

**1.7 COORDINATION:**

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Products: Subject to compliance with requirements, provide one of the products specified.
  3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METALS, GENERAL:

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 METALS:

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- D. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
  2. Material: Galvanized steel complying with ASTM A 653/A 653M, 0.108-inch (2.8-mm) nominal thickness.
- E. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
- F. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- G. Aluminum Plate and Sheet: ASTM B 209(ASTM B 209M), Alloy 6061-T6.
- H. Aluminum Extrusions: ASTM B 221(ASTM B 221M), Alloy 6063-T6.
- I. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061

2.4 FASTENERS:

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.



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- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A( ASTM F 568M, Property Class 4.6)); with hex nuts, ASTM A 563( ASTM A 563M)); and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593( ASTM F 738M)) for bolts and ASTM F 594( ASTM F 836M)) for nuts, Alloy Group 1 (A1).
- D. Anchor Bolts: ASTM F 1554, Grade 36.
  - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A 489.
- F. Machine Screws: ASME B18.6.3( ASME B18.6.7M)).
- G. Lag Bolts: ASME B18.2.1( ASME B18.2.3.8M)).
- H. Plain Washers: Round, ASME B18.22.1( ASME B18.22M)).
- I. Lock Washers: Helical, spring type, ASME B18.21.1( ASME B18.21.2M)).
- J. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- K. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593( ASTM F 738M)) and nuts complying with ASTM F 594( ASTM F 836M)).

**2.5 MISCELLANEOUS MATERIALS:**

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
  - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

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- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

**2.6 FABRICATION, GENERAL:**

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
  - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

**2.7 MISCELLANEOUS FRAMING AND SUPPORTS:**

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- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
  
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts if units are installed after concrete is placed.
  
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
  
- D. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
  - 1. Provide bearing plates welded to beams where indicated.
  - 2. Drill girders and plates for field-bolted connections where indicated.
  - 3. Where wood nailers are attached to girders with bolts or lag screws, drill holes at 24 inches (600 mm) o.c.
  
- E. Galvanize miscellaneous framing and supports where indicated.
  
- F. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

**2.8 LOOSE BEARING AND LEVELING PLATES:**

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
  
- B. Galvanize plates after fabrication.
  
- C. Prime plates with zinc-rich primer.

**2.9 STEEL WELD PLATES AND ANGLES:**

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

**2.10 METAL LADDERS:**

- A. General:
  - 1. Comply with ANSI A14.3 unless otherwise indicated.
  
- B. Steel Ladders:
  - 1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
  - 2. Space siderails of elevator pit ladders 12 inches (300 mm) apart.
  - 3. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
  - 4. Rungs: 3/4-inch- (19-mm-) diameter steel bars.
  - 5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

6. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
7. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
8. Galvanize and prime exterior ladders, including brackets and fasteners.
  - a. Comply with Section 050513 “Shop-Applied Coatings for Metal”
9. Prime ladders, including brackets and fasteners, with zinc-rich primer.

## 2.11 EXTERIOR LADDERS

### A. Manufacturer:

1. Acceptable Manufacturer: Precision Ladders, LLC, which is located at: P. O. Box 2279 ; Morristown, TN 37816-2279; Toll Free Tel: 800-225-7814; Tel: 423-586-2265; Email: info@PrecisionLadders.com; Web: www.PrecisionLadders.com

### B. Aluminum Fixed Vertical Ladder:

1. Aluminum Fixed Vertical Ladder and Components: Ladder, cage, rest platforms, floor mounting brackets, security doors, walk-thru, and side rails.
  - a. Model: Model FL -\*\*\* (\*\*\*= vertical height in inches) Aluminum Fixed Vertical Ladder as manufactured by Precision Ladders LLC.
  - b. Capacity: Unit shall support a 1500 lb (680 kg) loading without failure, and individual treads shall withstand a 3,000 lb (1361 kg) loading without failure.
  - c. Performance Standard: Units designed and manufactured to meet or exceed ANSI A14.3 and OSHA 1910.27.
2. Components:
  - a. Ladder Stringer: 2-1/2 inch by 1-1/16 inch by 1/8 inch (64 mm by 27 mm by 3 mm) extruded 6005-T5 aluminum channel. Pitch: 90 degrees.
  - b. Ladder Tread: 2-1/4 inch by 3/4 inch by 1/4 inch (57 mm by 19 mm by 6 mm) extruded 6005-T5 aluminum with deeply serrated top surface.
  - c. Ladder Mounting Bracket: 8-1/2 inch by 2 inch by 3 inch by 1/4 inch thick (216 mm by 51 mm by 76 mm by 6 mm) aluminum angle.
  - d. Walk-Thru:
    - 1) Hand Rails: 1-1/4 inch (32 mm) aluminum square tube with rounded edges.
    - 2) Mounting Brackets: 4 inch by 4 inch by 1/4 inch (102 mm by 102 mm by 6 mm) aluminum.
    - 3) Side Rails: 42 inch (1067 mm) side rail extension for through ladder exits.
  - e. Safety Cage:
    - 1) Vertical and horizontal bars: 1/4 inch by 2 inch (6 mm by 51 mm) 6005-T5 aluminum flat bar.
  - f. Rest Platform:
    - 1) 1/8 inch (3 mm) aluminum tread plate.
    - 2) Platform Size: 30” inches by 48 inches (762 mm by 1219 mm) standard.
    - 3) Toe Boards. 6005 T-5 aluminum.
    - 4) Handrails: 1-1/4 inch (32 mm) aluminum square tube 42 inches (1067 mm) high.

- g. Security Door: 0.125 inch (3 mm) 3003-H14 aluminum panel 84 inches (2134 mm) tall with padlock provision.
- h. Security Gate: Hinged gate at bottom of cage with padlock provision.
- i. Fall Prevention System: Complete system with rail, sleeves, and harness to limit any fall to 6 inches (152 mm) or less.
- j. Floor Brackets: Floor bracket at foot of each stringer, 3 by 2 by 1/4 inch (76 by 51 by 6 mm).
- k. Finishes:
  - 1) Standard: Mill finish on aluminum ladder components.

**2.12 METAL BOLLARDS:**

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch-(6.4-mm-) thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches(200 mm) deep and 3/4 inch(19 mm) larger than OD of bollard.
- C. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch(6.4-mm) wall-thickness steel tubing with an OD approximately 1/16 inch(1.5 mm) less than ID of bollards. Match drill sleeve and bollard for 3/4-inch(19-mm) steel machine bolt.
- D. Hot Dip galvanize and shop prime bollards with zinc-rich primer.
  - 1. Comply with Section 050513"Shop-Applied Coatings for Metal."

**2.13 ABRASIVE NOSINGS:**

- A. Cast-Metal Units: Cast aluminum, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. American Safety Tread Co., Inc.
    - b. Barry Pattern & Foundry Co., Inc.
    - c. Safe-T-Metal Company, Inc.
    - d. Wooster Products Inc.
  - 2. Configuration: Cross-hatched units, 3 inches(75 mm) wide without lip.
    - a. Basis of Design: Type 101SP; Wooster Products Inc.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

**2.14 ELEVATOR PIT SUMP COVERS**

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."
- B. Pressure-Locked Steel Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars or swaging crossbars between bearing bars.

1. Bearing Bar Spacing: 1-3/16 inches (30 mm) o.c.
  2. Bearing Bar Depth: 1-1/2 inch (38.1 mm).
  3. Bearing Bar Thickness: 3/16 inch (4.8 mm).
  4. Crossbar Spacing: 4 inches (102 mm) o.c.
  5. Traffic Surface: Smooth.
- C. Provide 1-1/2" x 1-1/2" x 1/8" steel angle supports.
- D. Galvanize and prime elevator pit sump cover, including brackets and fasteners.
- a. Comply with Section 050513 "Shop-Applied Coatings for Metal"

2.15 FINISHES, GENERAL:

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.16 STEEL AND IRON FINISHES:

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
  1. ASTM A 123/A 123M, for galvanizing steel and iron products.
  2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
  1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

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2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- D. **Fastening to In-Place Construction:** Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. **Corrosion Protection:** Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS:

- A. **General:** Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING BEARING AND LEVELING PLATES:

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
  2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING:

- A. **Touchup Painting:** Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

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1. Apply by brush or spray to provide a minimum 2.0-mil(0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000



PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Steel pipe and bar handrails and railings.
- B. Related Sections include the following:
  - 1. Division 05 Section "Shop Applied Coating for Metals" for galvanizing and shop priming exterior steel pipe handrails and railings.
  - 2. Division 05 Section "Metal Pan Stairs" for steel pipe handrails and railings included with metal stairs.

1.3 PERFORMANCE REQUIREMENTS:

- A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:
  - 1. Steel: 72 percent of minimum yield strength.
  - 2. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."
- B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections:
  - 1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf applied at any point and in any direction.
    - b. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  - 2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf applied at any point and in any direction.
    - b. Uniform load of 50 lbf/ft. applied in any direction.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.

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3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
  - a. Loads above need not be assumed to act concurrently with loads on top rails in determining stress on guard.
- C. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, over stressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

**1.4 SUBMITTALS:**

- A. Product Data: For the following:
  1. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.
  1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Test Reports: From a qualified testing agency indicating products comply with requirements, based on comprehensive testing of current products.
- E. Product Test Reports: From a qualified testing agency indicating handrails and railings comply with ASTM E 985, based on comprehensive testing of current products.

**1.5 QUALITY ASSURANCE:**

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

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- C. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.
- D. Regulatory Requirements: Railings and handrails:
  - 1. Top of gripping surfaces of handrails shall be 34" minimum and 38" maximum vertically above walking surfaces, stair nosings, and ramp surfaces. Handrails shall be at a consistent height above such surfaces.
  - 2. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1-1/2" minimum. Handrail may be located in a recess if the recess is 3" maximum deep and 18" minimum clear above the top of the handrail.
  - 3. Handrail gripping surfaces shall be continuous along their length and shall not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces shall not be obstructed for more than 20% of their length. Where provided, horizontal projections shall occur 1-1/2" minimum below the bottom of the handrail gripping surfaces.
  - 4. Handrail gripping surfaces with a circular cross section shall have an outside diameter of 1-1/4" minimum and 2" maximum.
  - 5. Handrail gripping surfaces with a non-circular cross section shall have an outside dimension of 4" minimum and 6-1/4" maximum, and a cross-sectional dimension of 2-1/4" maximum.
  - 6. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.
  - 7. Handrails shall not rotate within their fittings.
  - 8. Handrail gripping surfaces shall extend beyond and in the same direction of stair flights and ramp runs. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.
  - 9. A 2" minimum high curb or a barrier shall be provided to prevent the passage of a 4" diameter sphere rolling off the sides of a ramp surface. Such a curb or a barrier shall be continuous and uninterrupted along the length of a ramp..

1.6 STORAGE:

- A. Store handrails and railings in a dry, well ventilated, weather tight place.

1.7 PROJECT CONDITIONS:

- A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedules with construction progress to avoid delaying the Work.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION:

- A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project Site in time for installation.

1.9 SCHEDULING:

- A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS:

- A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
- B. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- C. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:
  - 1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
    - a. Black finish, unless otherwise indicated.
    - b. Galvanized finish for exterior installations and where indicated.
    - c. Type F, or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.
  - 2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.
  - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 WELDING MATERIALS, FASTENERS, AND ANCHORS:

- A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
  - 1. For steel handrails, railings, and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electro deposited zinc coating.
- C. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

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1. Cast-in-place anchors.
2. Expansion anchors.

2.3 PAINT:

- A. Shop Primers: Provide primers to comply with applicable requirements in Division 9 Section "Painting."
- B. Shop Primer for Ferrous Metal: Fast-curing, lead and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

2.4 GROUT AND ANCHORING CEMENT:

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION:

- A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
  1. Configurations: As indicated on Drawings.
- B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Form changes in direction of railing members as follows:
  1. As detailed.
  2. By bending.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout an entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- E. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.

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3. Remove flux immediately.
  4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.
- G. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- H. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches long with inside dimensions not less than ½ inch greater than outside dimensions of post, and steel plate forming bottom closure.
- I. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- J. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radiuses possible without causing grain separation or otherwise impairing the Work.
- K. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
- L. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
- M. Fabricate joints that will be exposed to weather in a watertight manner.
- N. Close exposed ends of handrail and railing members with prefabricated end fittings.
- O. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between the end of railing and wall is 1/4 inch or less.

**2.6 FINISHES, GENERAL:**

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

**2.7 STEEL FINISHES:**

- A. Galvanized Handrails and Railings: Hot-dip galvanize exterior steel and iron handrails and railings to comply with ASTM A 123. Hot-dip galvanize hardware for exterior steel and iron handrails and railings to comply with ASTM A 153/A 153M.
- B. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. For galvanized handrails and railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

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- D. For nongalvanized steel handrails and railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: After galvanizing, thoroughly clean handrails and railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.
- F. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed handrails and railings:
  - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6, "Commercial Blast Cleaning."
  - 2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush-off Blast Cleaning."
- G. Apply shop primer to prepared surfaces of handrail and railing components, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  - 1. Do not apply primer to galvanized surfaces.
  - 2. Stripe paint edges, corners, crevices, bolts, and welds.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

**3.2 INSTALLATION, GENERAL:**

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.
  - 1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
- C. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at the interval indicated, but not less than that required by structural loads.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS:

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS:

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturers' written instructions:
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturers' written instructions:
  - 1. Nonshrink, nonmetallic grout.
- C. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch build-up, sloped away from post.

3.5 ANCHORING RAILING ENDS:

- A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with postinstalled anchors and bolts unless otherwise indicated.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.
  - 1. Weld flanges to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS:

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
  - 1. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.7 CLEANING:

- A. Touch Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.



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**3.8 PROTECTION:**

- A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
  
- B. Restore finishes damaged during installation and construction periods so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish an entire unit, or provide new units.

END OF SECTION 055213

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Wood furring, grounds, nailers, and blocking.
  - 2. Sheathing for equipment backing panels.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 06 Section "Interior Architectural Woodwork" for interior woodwork not specified in this Section.

1.3 SUBMITTALS:

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
  - 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
  - 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
  - 3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.
- C. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with performance requirements indicated.
- D. Warranty of chemical treatment manufacturer for each type of treatment.

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1.4 DELIVERY, STORAGE, AND HANDLING:

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
  - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL:

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
  - 1. NELMA - Northeastern Lumber Manufacturers Association.
  - 2. NLGA - National Lumber Grades Authority (Canadian).
  - 3. SPIB - Southern Pine Inspection Bureau.
  - 4. WCLIB - West Coast Lumber Inspection Bureau.
  - 5. WWPA - Western Wood Products Association.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
  - 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece.
- D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  - 1. Provide dressed lumber, S4S, unless otherwise indicated.
  - 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS:

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWWA C2 (lumber) and AWWA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

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- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft.. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
  3. Wood framing members less than 18 inches above grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS:

- A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
1. Use treatment that does not promote corrosion of metal fasteners.
  2. Use Exterior type for exterior locations and where indicated.
  3. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
  4. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- C. Application: Treat items indicated on Drawings, and the following:
1. Concealed blocking.
  2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER:

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture Content: 19 percent maximum for lumber items are not specified to receive wood preservative treatment.
- D. Species: Douglas fir or southern yellow pine.
- E. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.5 MISCELLANEOUS MATERIALS:

- A. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

2.6 WOOD-BASED STRUCTURAL-USE PANELS:

- A. Structural-Use Panel Standards: Provide either all-veneer, mat-formed, or composite panels complying with DOC PS 2, "Performance Standard for Wood-Based Structural-Use Panels," unless otherwise indicated. Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood," where plywood is indicated.
- B. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.
- C. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 5/8 inch thick.

2.7 FASTENERS:

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where miscellaneous carpentry is exposed to weather, in ground contact, pressure-preservative treated or in area of high relative humidity, provide fasteners with a double-hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

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- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

**PART 3 - EXECUTION**

**3.1 INSTALLATION, GENERAL:**

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWP A M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- F. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
- G. Use fasteners of appropriate type and length. Pre-drill members when necessary to avoid splitting wood.

**3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS:**

- A. Install where shown and where required for screeding or attaching other work. Cut and shape to required size. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

**3.3 WOOD FURRING:**

- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

**3.4 INSTALLATION OF STRUCTURAL-USE PANELS:**

- A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
  - 1. Comply with "Code Plus" provisions of above-referenced guide.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Plywood Backing Panels: Screw to supports.

END OF SECTION 061053

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Wall sheathing.
  - 2. Roof sheathing.
  - 3. Flexible flashing at openings in sheathing.
- B. Related Sections include the following:
  - 1. Division 06 Section "Miscellaneous Rough Carpentry" for plywood backing panels.

1.3 SUBMITTALS:

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
  - 3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
  - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
  - 1. Fire-retardant-treated plywood.

1.4 QUALITY ASSURANCE:

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."



1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Stack panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 GYPSUM WALL SHEATHING:

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
- B. Product: Subject to compliance with requirements, provide one of the following:
  - 1. "Dens-Glass FireGuard Sheathing;" G-P Gypsum Corporation.
  - 2. "GlasRoc;" Certainteed.
  - 3. "Securock;" United States Gypsum Company.
  - 4. "GOLD BOND brand e2XP EXTENDED EXPOSURE SHEATHING;" National Gypsum.
- C. Type and Thickness: Type "X", 5/8 thick, unless otherwise noted.
- D. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.2 ROOF SHEATHING

- A. Plywood Sheathing: Exposure 1, Structural I sheathing.
  - 1. Span Rating: Not less than 32/16.
  - 2. Nominal Thickness: As indicated on drawings.
  - 3. Fire retardant treated.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  - 1. Use treatment that does not promote corrosion of metal fasteners.
  - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
  - 4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F (76 deg C) shall be not less than span ratings specified.

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- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all plywood unless otherwise indicated.
  - 1. Roof sheathing.

**2.4 FASTENERS:**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
  - 1. For steel framing less than 0.0329 inch (0.835 mm) thick, attach sheathing to comply with ASTM C 1002.
  - 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, attach sheathing to comply with ASTM C 954.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
  - 1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
  - 2. Provide washers or plates if recommended by sheathing manufacturer.

**2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS:**

- A. Sealant for Glass-Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing, and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

**2.6 MISCELLANEOUS MATERIALS:**

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.0 mm).
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
    - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing.

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- c. MFM Building Products Corp.; Window Wrap.
  - d. Polyguard Products, Inc.; Polyguard 300.
  - e. Protecto Wrap Company; BT-20 XL.
- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

**PART 3 - EXECUTION**

**3.1 INSTALLATION, GENERAL:**

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

**3.2 GYPSUM SHEATHING INSTALLATION:**

- A. Comply with GA-253 and with manufacturer's written instructions.
  - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
  - 2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
  - 3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
  - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

**3.3 FLEXIBLE FLASHING INSTALLATION:**

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
  - 1. Prime substrates as recommended by flashing manufacturer.
  - 2. Lap seams and junctures with other materials at least 4 inches (100 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
  - 3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
  - 4. Lap weather-resistant building paper over flashing at heads of openings.
  - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 061600

SECTION 072413 POLYMER-BASED EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Exterior insulation and finish system (EIFS) with drainage, applied over glass-mat gypsum sheathing.
- B. Related Sections include the following:
  - 1. Division 05 Section "Cold-Formed Metal Framing" for steel stud framing behind system.
  - 2. Division 06 Section "Sheathing" for glass-mat gypsum sheathing behind EIFS system.
  - 3. Division 07 Section "Sheet Metal Flashing and Trim" for metal flashings and counterflashings.
  - 4. Division 07 Section "Joint Sealants" for sealing joints in system with elastomeric joint sealants.

1.3 DEFINITIONS:

- A. Class PB Exterior Insulation and Finish System (EIFS) is defined by ASTM PS 49 as a "nonload bearing, exterior wall cladding system that consists of an insulation board attached either adhesively, mechanically, or both to the substrate; an integrally reinforced base coat; and a texture protective finish coat."
- B. Systems refer to Class PB EIFS.
- C. System manufacturer refers to EIFS manufacturer.

1.4 SUBMITTALS:

- A. Product Data: For each component of EIFS specified.
- B. Shop Drawings: For EIFS. Include plans, elevations, sections, details of components, details of penetration and termination, flashing details, joint locations and configurations, fastening and anchorage details including mechanical fasteners, and connections and attachments to other work.
- C. Samples for Initial Selection: Manufacturer's color charts and small-scale samples consisting of units or sections of units showing the full range of colors, textures, and patterns available for each finish choice indicated.

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- D. Samples for Verification: 24-inch-square panels for each finish, color, texture, and pattern specified. Prepare samples using same tools and techniques intended for actual work.
- E. Installer Certificates: Signed by system manufacturer certifying that installers comply with specified requirements.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.
- G. Material Certificates: Signed by manufacturers or a third-party agency approved by system manufacturer certifying that each of the following items complies with requirements:
  - 1. Insulation.
- H. Product Test Reports: Indicate compliance of proposed EIFS with physical property requirements specified in "Performance Requirements" Article based on comprehensive testing of current products by a qualified testing and inspecting agency.
- I. Research/Evaluation Reports: Evidence of EIFS compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

**1.5 QUALITY ASSURANCE:**

- A. Installer Qualifications: Shall be knowledgeable in the proper installation of the FM system and shall be experienced and competent in the installation of Exterior Insulation and Finish Systems.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain materials for system from one source and by a single manufacturer or by manufacturers approved by EIFS manufacturer as compatible with other system components.
- D. Fire-Test-Response Characteristics: Provide system assemblies and components with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.
  - 1. Flame Spread of Insulation Board and Finish Coats: 25 or less when tested individually per ASTM E 84.
  - 2. Smoke Developed of Insulation Board and Finish Coats: 450 or less when tested individually per ASTM E 84.
  - 3. The adhesives and coatings shall have a Flame Spread index not exceeding 20 and a Smoke Developed index not exceeding 10.
  - 4. Ignitability Characteristics: NFPA 268; passed.

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- E. Mockups: Before installing system, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work:
1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect seven days in advance of the dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Architect's approval of mockups before starting fabrication of work.
  5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    - a. Protect mockups from weather and from construction activities. Brace mockups to resist design wind loads and provide waterproof coverings for construction materials not intended to be permanently exposed to the weather.
    - b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials in original, unopened packages with manufacturer's labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
1. Stack insulation board flat and off the ground.
  2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.7 PROJECT CONDITIONS:

- A. Environmental Limitations: Do not install system when ambient outdoor air and substrate temperatures are 40 deg F and falling unless temporary protection and heat are provided to maintain ambient temperatures above 40 deg F during installation of wet materials and until they have dried thoroughly and become weather resistant, but for at least 24 hours after installation.

1.8 COORDINATION AND SCHEDULING:

- A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, flashing, trim, joint sealers, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind EIFS.

1.9 WARRANTY:

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of EIFS-clad drainage-wall assemblies that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Bond integrity and weathertightness.
    - b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.
  - 2. Warranty coverage includes the following components of EIFS-clad drainage-wall assemblies:
    - a. EIFS finish, including base coats, finish coats, and reinforcing mesh.
    - b. Insulation installed as part of EIFS.
    - c. Insulation adhesive.
    - d. EIFS accessories, including trim components and flashing.
    - e. Water-resistive coatings.
    - f. EIFS drainage components.
  - 3. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Basis-of-Design Product: The design for EIFS is based on **Outsulation System, Plus MD; Dryvit Systems, Inc.**, Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  - a. Parex, Inc.
  - b. Pleko Systems International, Inc.
  - c. Senegy Inc.; SKW-MBT Construction Chemicals.
  - d. Sonneborn, Div. of ChemRex, Inc.; SKW-MBT Construction Chemicals.
  - e. Sto Corp.



## 2.2 PERFORMANCE REQUIREMENTS:

- A. EIFS Performance: Comply with ASTM E 2568 and with the following:
1. Weathertightness: Resistant to uncontrolled water penetration from exterior, with a means to drain water entering EIFS to the exterior.
  2. System Fire Performance: Full-scale multistory fire test.
  3. Structural Performance: EIFS assembly and components shall comply with ICC-ES AC219 when tested according to ASTM E 2568.
    - a. Wind Loads: Uniform pressure as indicated on Drawings.
  4. Impact Performance: ASTM E 2568, Standard resistance. Ultra-high impact resistant to with-in 8 feet of finish grade surface.
  5. Bond Integrity: Free from bond failure within EIFS components or between EIFS and substrates, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
  6. Abrasion Resistance of Finish Coat: Sample consisting of 1-inch-25.4-mm- thick EIFS mounted on 1/2-inch-12.7-mm- thick gypsum board; cured for a minimum of 28 days and shows no cracking, checking, or loss of film integrity after exposure to 528 quarts 500 L of sand when tested according to ASTM D 968, Method A.
  7. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch 50.8-by-50.8-mm clean glass substrate; cured for 28 days and shows no growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274.

## 2.3 MATERIALS:

- A. Compatibility: Provide substrates, adhesive, board insulation, reinforcing meshes, base- and finish-coat materials, sealants, and accessories that are compatible with one another and approved for use by system manufacturer for Project.
- B. Colors, Textures, and Patterns of Finish Coats: Match colors and textures indicated by referencing system manufacturer's standard designations for these characteristics:
1. Colors:
    - a. **EIFS-1:**
      - 1) Texture: Sandpebble Fine - DPR; Dryvit.
      - 2) Color: Dryvit #454A - Stone Gray 30% darker.
    - b. **EIFS-2:**
      - 1) Texture: Finesse - DPR; Dryvit.
      - 2) Color: Match Sherwin Williams #9165 "Gossamer Veil."

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- c. **EIFS-3:**
  - 1) Texture: Finesse - DPR; Dryvit.
  - 2) Color: Match Sherwin Williams #6143 "Basket Beige."
  
- d. **EIFS-4:**
  - 1) Texture: Sandpebble Fine - DPR; Dryvit.
  - 2) Color: Match Sherwin Williams #7675 "Seal Skin."
  
- e. **EIFS-5:**
  - 1) Texture: Finesse - DPR; Dryvit.
  - 2) Color: Dryvit #454A - Stone Gray 30% darker.
  
- C. Metal Framing: Comply with requirements in Division 05 Section "Cold-Formed Metal Framing."
  
- D. Sheathing: Comply with requirements in Division 06 Section "Sheathing."
  
- E. Primer-Sealer: System manufacturer's standard substrate conditioner designed to seal substrates from moisture penetration and to improve the bond between substrate of type indicated and adhesive used for application of insulation.
  
- F. Air/Water-Resistive Barrier Components:
  - 1. Dryvit Backstop® NT: A flexible, polymer-based noncementitious water-resistive coating available in Texture and Smooth.
  - 2. Dryvit Grid Tape™: An open weave fiberglass mesh tape with pressure sensitive adhesive available in rolls 102 mm (4 in) wide by 91 m (100 yds) long.
  
- G. Flexible-Membrane Flashing: Cold-applied, self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.
  
- H. Flashing Materials: Used to protect substrate edges at terminations.
  - 1. Liquid Applied: An extremely flexible water-based polymer material, ready for use.
    - a. AquaFlash and AquaFlash Mesh.
  - 2. Sheet Type: Shall be Flashing Tape and Surface Conditioner.
    - a. Dryvit Flashing Tape™: A high density polyethylene film backed with a rubberized asphalt adhesive available in rolls 102 mm (4 in), 152 mm (6 in) and 229 mm (9 in) wide by 23 m (75 ft) long.
    - b. Dryvit Flashing Tape Surface Conditioner™: A water-based surface conditioner and adhesion promoter for the Dryvit Flashing Tape.

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- I. Adhesive for Application of Insulation: System manufacturer's standard formulation designed for indicated use, compatible with substrate, and complying with the following requirements:
1. Factory-mixed formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by system manufacturer.
  2. Dryvit Genesis FM.
- J. Molded-Polystyrene Board Insulation: Rigid, cellular thermal insulation formed by expansion of polystyrene resin beads or granules in a closed mold. Comply with system manufacturer's requirements, ASTM C 578 for Type I, and "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for more stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
1. Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.
  2. Provide insulation in boards in thickness indicated but not less than 2 inches and not more than 4 inches or less than that allowed by ASTM PS 49.
  3. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, according to ASTM E 84.
  4. Insulation Board: Expanded Polystyrene meeting Dryvit Specification for Insulation Board, DS131.
  5. The insulation board shall be manufactured by a board supplier listed by Dryvit Systems, Inc.
  6. Form cornice and trim molding in the profiles indicated on the drawings.
- K. Reinforcing Mesh: Balanced, alkali-resistant, open-weave glass-fiber mesh treated for compatibility with other system materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. per EIMA 105.01, complying with ASTM D 578 and the following requirements for minimum weight:
1. Standard Reinforcing Mesh: Not less than 4.3 oz./sq. yd.
  2. Impact-Resistant Reinforcing Mesh: Not less than 20.5 oz./sq. yd.
  3. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd.
  4. Detail Reinforcing Mesh: Not less than 4.3 oz./sq. yd.
  5. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd.
- L. Base-Coat Materials: System manufacturer's standard mixture complying with the following requirements for material composition and method of combining materials:
1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use indicated.
  2. Dryvit Genesis FM.
- M. Primer: System manufacturer's standard factory-mixed elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

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- N. Finish-Coat Materials: System manufacturer's standard mixture complying with the following requirements for material composition and method of combining materials:
  - 1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
- O. Water: Potable.
- P. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with system manufacturer's written requirements, manufactured from vinyl plastic and complying with ASTM C 1063.
- Q. Drainage Track: UV treated PVC "J" channel perforated with weep holes, complying with ASTM D 1784 and ASTM C 1063. Drainage track usage is limited to the base of the system at finished grade level. All other horizontal terminations shall utilize the Dryvit Drainage Strip as shown in Outsulation Plus MD Installation Details, DS110. Shall be one of the following:
  - 1. Starter Trac STWP – without drip edge by Plastic Components, Inc.
  - 2. Starter Trac STDE – with drip edge by Plastic Components, Inc.
  - 3. Universal Starter Track by Wind-lock Corporation
  - 4. Sloped Starter Strip with Drip by Vinyl Corp.
- R. Dryvit Drainage Strip™: A corrugated plastic sheet material, which provides drainage.

**2.4 MIXING:**

- A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of system. Proceed with installation of system only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION:**

- A. Protect contiguous work from moisture deterioration and soiling caused by application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.

- C. Prepare and clean substrates to comply with system manufacturer's written requirements to obtain optimum bond between substrate and adhesive for insulation.
  - 1. Apply primer-sealer over gypsum sheathing substrates to protect sheathing from degradation.

### 3.3 INSTALLATION:

- A. Comply with ASTM PS 49 and system manufacturer's written instructions for installation of system as applicable to each type of substrate indicated.
  - 1. Comply with Dryvit Outsulation Plus MD System Application Instructions, DS218.
- B. Apply trim accessories at perimeter of system, at expansion joints, and elsewhere, as indicated. Use drip screed at bottom edge of system, unless otherwise indicated.
- C. Adhesively attach insulation to comply with ASTM PS 49, system manufacturer's written requirements, and the following:
  - 1. Cementitious Adhesive:
    - a. Notched Trowel Method
      - 1) With a notched trowel, 9.5 mm (3/8 in) wide, 12.7 mm (1/2 in) deep notches spaced 38 mm (1 1/2 in) apart, apply the adhesive mixture to the backside of the insulation board. Holding the trowel at a 45° angle, apply firm pressure to the insulation board in order to scrape the excess adhesive from between the adhesive beads. **NOTE: Apply the adhesive so that the ribbons run vertically when the insulation board is placed on the wall.**
    - 2. Position the insulation board horizontally on the substrate. Press the board gently to the substrate and slide it into position. Apply firm pressure over the entire surface of the insulation board to ensure uniform contact and high initial grab.
    - 3. Install subsequent rows of insulation board in a running bond pattern (vertical joints staggered).
    - 4. Allow adhered insulation to remain undisturbed for period recommended by system manufacturer, but not less than 24 hours, before beginning rasping and sanding insulation, and applying base coat and reinforcing mesh.
    - 5. Interlock ends at internal and external corners.
    - 6. Abut boards tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between insulation boards. If gaps greater than 1/16 inch occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
    - 7. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
    - 8. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch.

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9. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at features to less than  $\frac{3}{4}$  inch.
  10. Interrupt insulation for expansion joints where indicated.
  11. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
  12. Treat exposed edges of insulation board as follows:
    - a. Wrap edges after installing insulation board and before applying field-applied reinforcing mesh.
    - b. Wrap mesh of width required to extend not less than 2-1/2 inches onto substrate behind insulation board, cover insulation board edge, and extend not less than 2-1/2 inches onto insulation board face.
    - c. Wrap edges of insulation board, except those forming substrates of sealant joints, by encapsulating with base coat, reinforcing mesh, and finish coat.
    - d. Wrap edges of insulation board forming substrates of sealant joints within system or between system and other work by encapsulating with base coat and reinforcing mesh.
- D. Install trim accessories at locations indicated according to system manufacturer's written instructions.
- E. Install expansion joints at locations indicated, where required by system manufacturer, and as follows:
  1. Where expansion joints are indicated in substrates behind EIFS.
  2. Where EIFS adjoins dissimilar substrates, materials, and construction.
  3. Where wall height changes or building height changes.
  4. At floor lines.
- F. Apply base coat to exposed surfaces of insulation in minimum thickness specified by system manufacturer.
- G. Embed reinforcing mesh of type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM PS 49 and system manufacturer's written requirements. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.
  1. Standard reinforcing mesh, unless otherwise indicated.
  2. Install impact resistant mesh to within 8'-0" of finish grade.

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- H. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch-wide strip reinforcing mesh at both inside and outside corners, unless base layer of mesh is lapped not less than 4 inches on each side of corners.
  - 1. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches wide.
  - 2. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.
- I. Apply primer over dry base coat according to system manufacturer's written instruction.
- J. Apply finish coat over dry primer, maintaining a wet edge at all times for uniform appearance, in thickness required by system manufacturer to produce a uniform finish of color and texture matching approved sample.

**3.4 FIELD QUALITY CONTROL:**

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. As stipulated in Ch. 17 of the IBC.
  - 2. According to ICC-ES AC235.
- B. EIFS will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

**3.5 CLEANING AND PROTECTING:**

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive system coatings.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer and system manufacturer, that ensure system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 072413

SECTION 075216 STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. New 3-ply modified bituminous membrane roofing.
  - 2. Roofing insulation.
  - 3. Walkways.
- B. Related Sections include the following:
  - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking, curbs, cants, and nailers; and wood-based, structural-use roof deck panels.
  - 2. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
  - 3. Division 07 Section "Roof Accessories."
  - 4. Division 07 Section "Joint Sealants."
  - 5. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS:

- A. Roofing Terminology: Refer to ASTM D 1079 for definitions of terms related to roofing work not otherwise defined in this Section.

1.4 PERFORMANCE REQUIREMENTS:

- A. General: Install a watertight, modified bituminous membrane roofing and base flashing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure.
- B. FM Listing: Provide modified bituminous membrane, base flashings, and component materials that meet requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.
  - 1. Roofing system shall comply with the following:
    - a. Fire/Windstorm Classification: Class 1A-90.
    - b. FM 4450 or UL 1256.
    - c. Hail-Resistance Rating: SH.



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C. Roofing System Design: Provide a roofing system designed for wind uplift that complies with roofing system manufacturer's written design instructions and with the following:

1. Wind Speed at Project Site: 110 mph.

**1.5 SUBMITTALS:**

A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

B. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: Of the following products:

1. 12-by-12-inch square of base sheet, and base-ply sheet.
2. 12-by-12-inch square of modified bituminous, granule-surfaced cap sheets, of color specified.
3. 12-by-12-inch square of walkway pad.
4. Six insulation fasteners of each type, length, and finish.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system and is eligible to receive the standard roofing manufacturer's warranty.

E. Manufacturer Certificates: Signed by roofing system manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of complying with requirements.

1. Certificate Of Analysis from the testing laboratory of the primary roofing materials manufacturer, confirming the physical and mechanical properties of the roofing membrane components. Testing shall be in accordance with the parameters published in ASTM D 5147 and ASTM D 6298\* and indicate Quality Assurance/Quality Control data as required to meet the specified properties. A separate Certificate Of Analysis for each production run of material shall indicate the following information:

- a. Material type
- b. Lot number
- c. Production date
- d. Dimensions and Mass (indicate the lowest values recorded during the production run);

- 1) Roll length
- 2) Roll width

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- 3) Selvage width
  - 4) Total thickness
  - 5) Thickness at selvage (coating thickness)
  - 6) Weight
- e. Physical and Mechanical Properties;
- 1) Low temperature flexibility
  - 2) Maximum load
  - 3) Elongation @ 5% Maximum Load (ultimate elongation)
  - 4) Dimensional stability
  - 5) High Temperature Stability
  - 6) Granule embedment
  - 7) Resistance to thermal shock\* (foil faced products)
- F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Research/Evaluation Reports: Evidence of roofing system's compliance with building code in effect for Project from a model code organization acceptable to authorities having jurisdiction.
- H. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.
- I. Warranty: Sample copy of standard roofing manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.
- J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roof installation.
- K. Letter from the proposed primary roofing manufacturer confirming that the filler content in the elastomeric blend of the proposed roof membrane and flashing components does not exceed 35% in weight.
- L. Complete list of material physical and mechanical properties for each sheet including: weights and thicknesses; low temperature flexibility; maximum load; elongation @ 5% maximum load (ultimate elongation); dimensional stability; high temperature stability; granule embedment and resistance to thermal shock (foil faced products).
- M. Letter from the proposed primary roofing manufacturer confirming that the proposed roof membrane system meets the requirements of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14F (-10°C). Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles in an unaged specimen and 200 cycles in a specimen after heat conditioning.

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- N. Letter from the proposed primary roofing manufacturer confirming that proposed membrane manufacturer has been producing SBS products in the United States for a minimum of 5 years without a change in the basic product design or SBS modified bitumen blend, polymer specification, asphalt and filler formulation.
- O. Evidence that the manufacturer of the proposed roofing system utilizes a quality management system that is ISO 9001:2000 certified. Documentation of ISO 9001:2000 certification of foreign subsidiaries without domestic certification will not be accepted.
- P. Evidence and description of manufacturer's quality control/quality assurance program for the primary roofing products supplied. The quality assurance program description shall include all methods of testing for physical and mechanical property values. Provide confirmation of manufacturer's certificate of analysis for reporting the tested values of the actual material being supplied for the project prior to issuance of the specified guarantee.

1.6 QUALITY ASSURANCE:

- A. **Installer Qualifications:** Engage an experienced installer to perform Work of this Section who has specialized in installing roofing similar to that required for this Project; who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product; and who is eligible to receive the standard roofing manufacturer's warranty.
- B. **Fire-Test-Response Characteristics:** Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Exterior Fire-Test Exposure: Class A; complying with ASTM E 108, for application and slopes indicated.
  - 2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing materials are a part.
- C. **Preliminary Roofing Conference:** Before starting any work for the Project, conduct conference at Project site. Meet with the same participants and review the same items listed for the preinstallation conference. In addition, review status of submittals and coordination of work related to roof construction. Notify participants at least 5 working days before conference.
- D. **Preinstallation Conference:** Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.
  - 1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
  - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.
4. Review loading limitations of deck during and after roofing.
5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
6. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

**1.7 DELIVERY, STORAGE, AND HANDLING:**

- A. Store roofing materials in a dry, well-ventilated, weathertight location to ensure no significant moisture pickup and maintain at a temperature exceeding roofing system manufacturer's written instructions. Store rolls of felt and other sheet materials on end on pallets or other raised surfaces. Do not double-stack rolls.
  1. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.
- B. Do not leave unused felts and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather and moisture and unless maintained at a temperature exceeding 50 deg F.
- C. Deliver and store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
- D. Protect roofing insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

**1.8 PROJECT CONDITIONS:**

- A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

**1.9 WARRANTY:**

- A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

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- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of built-up roofing such as built-up roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:
  - 1. Warranty Period: Twenty years from date of Substantial Completion.
- C. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS:**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. SBS-Modified Bituminous Sheet:
    - a. Firestone Building Products.
    - b. GAF Materials Corporation.
    - c. Johns Manville.
    - d. Siplast, Inc.
    - e. Soprema Roofing and Waterproofing, Inc.
- B. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.

**2.2 SBS-MODIFIED BITUMINOUS SHEET:**

- A. Cap Sheet: ASTM D 6164, Grade S, Type II, SBS-modified asphalt sheet (reinforced with polyester fabric); smooth surfaced; suitable for application method specified.
  - 1. Firestone; SBS Premium FR Torch.
  - 2. Soprema; Sopralene Flam 250 FR GR.
  - 3. GAF Materials Corporation; Ruberoid SBS Heat-Weld Plus Granule FR.
- B. Cap Sheet: ASTM D 6163, Grade G, Type I, glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced; with a white granular surface; suitable for application method specified, and as follows:
  - 1. Siplast; Paradiene 30 FR TG.
  - 2. Soprema: Elastophene Flam LS FR GR.

- C. Cap Sheet Color: Gray.

2.3 BASE-PLY SHEET MATERIALS:

- A. Base-Ply Sheet: ASTM D 6164, Grade S, Type I polyester-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
1. Firestone; Poly Torch Base.
  2. Soprema; Flam 180.
- B. Base-Ply Sheet: ASTM D 6163, Grade S, Type I, glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
1. Siplast Paradiene 20 TG
  2. GAF Materials Corporation; Ruberoid 20.
  3. Soprema: Elastophene Flam 2.2.

2.4 BASE-SHEET MATERIALS:

- A. Base Sheet: ASTM D 6164, Grade S, Type I polyester-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
1. Firestone; Poly Torch Base.
  2. Soprema; Flam 180
- B. Base Sheet: ASTM D 6163, Grade S, Type I, glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
1. Siplast Paradiene 20 TG
  2. GAF Materials Corporation; Ruberoid 20.

2.5 BASE FLASHING SHEET MATERIALS:

- A. Backer Sheet: ASTM D 6164, Grade S, Type I or II, polyester or fiberglass-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
- B. Flashing Sheet: ASTM D 6198, SBS-modified bituminous sheet material using foil facing; suitable for application method specified, and as follows:
1. Firestone SBS Metal Flash-AL.
  2. Soprema Sopralast 50 TV ALU.
  3. Siplast Veral Aluminum.

2.6 AUXILIARY MEMBRANE MATERIALS:

- A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with SBS-modified bituminous roofing.
  - 1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.
- B. Mastic Sealant: Polyisobutylene, plain or modified bituminous, nonhardening, nonmigrating, nonskinning, and nondrying.
- C. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470; designed for fastening for backnailing modified bituminous membrane to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.
- D. Metal Flashing Sheet: Metal flashing sheet is specified in Division 7 Section "Sheet Metal Flashing and Trim."
- E. Wood Nailer Strips: Furnish wood nailer strips complying with requirements of Division 6 Section "Miscellaneous Carpentry."
- F. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve.
  - 1. Color: To match color of cap sheet.
- G. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
- H. Glass-Fiber Fabric: Woven glass cloth, treated with asphalt; complying with ASTM D 1668, Type 1.
- I. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer for intended use.
- J. Substrate Joint Tape: 6 or 8 inches wide, coated, glass-fiber joint tape.
- K. Liquid Flashing:
  - 1. Alsan Flashing resin; Soprema.
    - a. Tensile strength @ break, (psi) 368 ASTM D 412
    - b. Elongation (%) 672 ASTM D 412
    - c. Tear resistance (lbf) 23.0 ASTM D 903
    - d. Tear resistance (lbf) 57.27 ASTM D 41547 Sec. 7
    - e. Water vapor transmission 11 ASTM D 1653 (perms)

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- f. Impact resistance Shore A 74 ASTM D 2240
  - g. Low temperature flexibility (°C)- 26 ASTM D 5147 Sec. 11
  - h. Usage time > 2 hours
  - i. Rainproof after 2 - 12 hours
  - j. Fully cured 3 days -
2. Soprema Alsan PolyFleece is used as flashing reinforcement with Alsan Flashing and other Alsan liquid-applied resins. It is highly flexible, conforms to any shape, irregular penetrations and other surfaces. It has excellent coating saturation capabilities into elastomeric resins.

**2.7 ROOF INSULATION:**

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- 1. R-Value: Provide insulation thickness (minimum 2-layer application) as required to provide an average, aged "R" value of 20.0, when tested in accordance with 15 year Long Term Thermal Resistance values determined in accordance with CAN/ULC S 770 .
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
- 1. Manufacturers:
    - a. Atlas Roofing Corporation.
    - b. Firestone Building Products Company.
    - c. GAF Materials Corporation.
    - d. Hunter Panels, LLC.
    - e. Johns Manville.
- C. Composite Polyisocyanurate Board Insulation: ASTM C 1289, faced with insulation board on one major surface, as indicated below by type, and felt or glass-fiber mat facer on the other.
- 1. Manufacturers:
    - a. Atlas Roofing Corporation.
    - b. Firestone Building Products Company.
    - c. GAF Materials Corporation.
    - d. Hunter Panels, LLC.
    - e. Johns Manville International, Inc.
- D. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, unless otherwise indicated.
- E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.



2.8 INSULATION ACCESSORIES:

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Insulation Cover Board:
  - 1. Available Products: 1/2" minimum. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dens-Deck Prime; Georgia Pacific.
    - b. DuraBoard; Johns Manville.
    - c. CertainTeed Corporation; GlasRoc Sheathing.
    - d. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
    - e. Sheathing.
    - f. Temple-Inland Building Products by Georgia-Pacific; GreenGlass Exterior Sheathing.
    - g. United States Gypsum Company; Securock Glass Mat Roof Board.
- C. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.
  - 1. Cold Adhesive: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Fast Adhesive: Carlisle SynTec Incorporated.
    - b. High Velocity Insulation Adhesive; Soprema.
    - c. Armorlock Insulation Adhesive; Honeywell.
    - d. Para-Stik Insulation Adhesive, Siplast.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- E. Insulation Cant Strips: ASTM C 728, perlite insulation board.
- F. Wood Nailer Strips: Comply with requirements in Division 6 Section "Miscellaneous Carpentry."
- G. Tapered Edge Strips: ASTM C 728, perlite insulation board.
- H. Substrate Joint Tape: 6- or 8-inch- wide, coated, glass-fiber joint tape.

2.9 ROOF WALKWAYS:

- A. Walkway Pads: Mineral-surfaced asphaltic composition panels, factory formed, nonporous, with a slip-resisting surface texture, manufactured specifically for adhering to modified bituminous membrane roofing as a protection course for foot traffic, of the following thickness:
  - 1. Thickness: 3/4 inch.
  - 2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Whitewalk Roof Pads; W.R. Meadows.
    - b. Suprawalk; Suprema.
    - c. Trafbloc by Siplast.
    - d. Paratread; Siplast.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.
- B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.
- C. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at roof penetrations and terminations and match the thicknesses of insulation required.
  - 1. Verify that wood nailer strips are located perpendicular to roof slope and are spaced according to requirements of roofing system manufacturer.
- D. Verify that flatness and fastening of metal roof decks comply with installation tolerances specified in Division 5 Section "Steel Deck."
- E. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane.
- F. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

**3.3 GENERAL INSTALLATION REQUIREMENTS:**

- A. Install modified bituminous membrane roofing system according to roofing system manufacturer's written instructions and applicable recommendations of NRCA/ARMA's "Quality Control Recommendations for Polymer Modified Bitumen Roofing."
  - 1. Install roofing system according to applicable specification plates of NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Start installation of modified bituminous membrane roofing in presence of roofing system manufacturer's technical personnel.
- C. Shingling Plies: Install modified bituminous membrane roofing system with ply sheets shingled uniformly to achieve required number of membrane plies throughout. Shingle in direction to shed water.
  - 1. Where roof slope exceeds 1/2 inch per 12 inches, run sheets of modified bituminous membrane roofing parallel with slope. Backnail top ends of sheets to nailer strips if the slope is greater than 2-1/2 inches per 12 inches.
- D. Cooperate with inspecting and testing agencies engaged or required to perform services for installing modified bituminous membrane roofing system.
- E. Coordinate installing roofing system components so insulation and roofing plies are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.
  - 1. Provide cutoffs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed.
  - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
  - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

**3.4 INSULATION INSTALLATION:**

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- B. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
  - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

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- E. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 1-1/2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- H. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
  - 1. Fasten first layer of insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
  - 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
  - 3. Fasten first layer of insulation to metal deck using mechanical fasteners.
  - 4. Install subsequent layers of insulation in cold adhesive.
- I. Install overboards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing system manufacturer.
  - 1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
  - 2. Adhere to substrate in a uniform coating of cold-applied adhesive.

**3.5 ROOF MEMBRANE INSTALLATION:**

- A. General: Install modified bituminous membrane over area to receive roofing, according to manufacturer's written instructions. Extend modified bituminous membrane over and terminate beyond cants.
  - 1. Unroll sheet and allow it to relax for the minimum time period required by manufacturer.
- B. Three-Ply, Modified Bituminous Membrane: Install 3 plies of modified bituminous membrane, consisting of a base ply, an intermediate ply and a finish ply, starting at low point of roofing system.
  - 1. Base-, Intermediate and Finish-Ply Application: Torch apply to substrate.
- C. Laps: Accurately align sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
  - 1. Repair tears and voids in laps and lapped seams not completely sealed.
  - 2. Apply granules, while asphalt is hot, to cover asphalt bead exuded at laps.

- D. Install modified bituminous membranes with side laps shingled with slope of roof deck where possible.
  - 1. Install modified bituminous membranes with side laps shingled in direction to shed water on each large area of roofing, where slope exceeds 1/2 inch per 12 inches.

**3.6 FLASHING AND STRIPPING INSTALLATION:**

- A. Install modified bituminous membrane base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
  - 1. Backer Sheet Application: Install base-sheet backer and mechanically fasten to substrate. Adhere flashing backer sheet over roof membrane at cants in cold-applied adhesive.
  - 2. Base Flashing Application: Adhere modified bituminous membrane base flashing to substrate in cold-applied adhesive, applied to substrate and back of base flashing at rate required by roofing system manufacturer.
- B. Extend base flashing up the wall a minimum of 8 inches above roof membrane and 4 inches onto field of roof membrane.
- C. Mechanically fasten top of modified bituminous membrane base flashing securely at terminations and perimeter of roofing.
  - 1. Seal top termination of base flashing.

**3.7 LIQUID FLASHING AT ROOF PENETRATIONS:**

- A. SURFACE PREPARATION: Ensure that the modified membrane is clean, dry and free from dust, laitance, grease, oil and any other contaminants.
- B. Install liquid flashing system according to manufacturer's recommendations.
  - 1. Extend liquid flashing not less than 3 inches (76 mm) in all directions from edges of item being flashed.
  - 2. Embed granules, matching color of roof membrane, into wet compound.

**3.8 WALKWAY INSTALLATION:**

- A. Walkway Cap Sheet Strips: Install roofing membrane walkway cap sheet strips over roofing membrane by torch application, or set in 5inch squares of roof cement.

**3.9 FIELD QUALITY CONTROL:**

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
  - 1. Notify Architect and Owner 48 hours in advance of the date and time of inspection.

3.10 PROTECTING AND CLEANING:

- A. Protect modified bituminous membrane roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove modified bituminous roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair base flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 ROOFING INSTALLER'S WARRANTY:

- A. WHEREAS <NAME> of <ADDRESS>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
  - 1. Owner:
  - 2. Address:
  - 3. Building Name/Type:
  - 4. Address:
  - 5. Area of Work:
  - 6. Acceptance Date:
  - 7. Warranty Period:
  - 8. Expiration Date:
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
  - 1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    - a. lightning;
    - b. peak gust wind speed exceeding 72 mph;
    - c. fire;
    - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;

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- e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
  - f. vapor condensation on bottom of roofing; and
  - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
- 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.
  - 3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.
  - 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void, unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
  - 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
  - 6. The Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
  - 7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.
- E. IN WITNESS THEREOF, this instrument has been duly executed this <DAY> day of <MONTH>, 20<YEAR>.

- 1. Authorized Signature:
- 2. Name:
- 3. Title:

END OF SECTION 075216

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Adhered membrane roofing system.
  - 2. Roof insulation.
- B. Related Sections include the following:
  - 1. Division 6 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking .
  - 2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
  - 3. Division 7 Section "Joint Sealants."
  - 4. Division 22 Section "Roof Drains."

1.3 DEFINITIONS:

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.
- C. Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," after multiplication by a safety factor.

1.4 PERFORMANCE REQUIREMENTS:

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7.
  - 1. Corner Uplift Pressure: Reference Structural Drawings.



2. Perimeter Uplift Pressure: Reference Structural Drawings.
  3. Field-of-Roof Uplift Pressure: Reference Structural Drawings.
- D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
1. Fire/Windstorm Classification: Class 1A-90.
  2. Hail Resistance: MH.
- E. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

### 1.5 SUBMITTALS:

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
1. Base flashings and membrane terminations.
  2. Tapered insulation, including slopes.
  3. Insulation fastening patterns.
- C. Samples for Verification: For the following products:
1. 12-by-12-inch (300-by-300-mm) square of sheet roofing, of color specified, including T-shaped side and end lap seam.
  2. 12-by-12-inch (300-by-300-mm) square of roof insulation.
  3. 12-by-12-inch (300-by-300-mm) square of walkway pads or rolls.
  4. 12-inch (300-mm) length of metal termination bars.
  5. 12-inch (300-mm) length of battens.
  6. 10 lb (4.5 kg) of aggregate ballast in each color and gradation indicated.
  7. Walkway pads or rolls, of color required.
  8. Six insulation fasteners of each type, length, and finish.
  9. Six roof cover fasteners of each type, length, and finish.
  10. Roof paver, full sized, 24" x 24".
- D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of meeting performance requirements.
  2. Manufacturer's Specifications, product test reports, installation instructions and evidence of UL and FM ratings for system.
- F. Qualification Data: For Installer and manufacturer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.
- H. Research/Evaluation Reports: For components of membrane roofing system.

- I. Maintenance Data: For roofing system to include in maintenance manuals.
- J. Warranties: Special warranties specified in this Section.
- K. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

**1.6 QUALITY ASSURANCE:**

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Manufacturer Qualifications: A qualified manufacturer that has FMG approval for membrane roofing system identical to that used for this Project.
- C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain components for membrane roofing system from or approved by roofing membrane manufacturer.
- E. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
  - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
  - 2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.
- F. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
  - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
  - 5. Review structural loading limitations of roof deck during and after roofing.
  - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
  - 7. Review governing regulations and requirements for insurance and certificates if applicable.
  - 8. Review temporary protection requirements for roofing system during and after installation.
  - 9. Review roof observation and repair procedures after roofing installation.

- G. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
  2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
  5. Review structural loading limitations of roof deck during and after roofing.
  6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
  7. Review governing regulations and requirements for insurance and certificates if applicable.
  8. Review temporary protection requirements for roofing system during and after installation.
  9. Review roof observation and repair procedures after roofing installation.

**1.7 DELIVERY, STORAGE, AND HANDLING:**

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

**1.8 PROJECT CONDITIONS:**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY:

- A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
  - 1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, roof pavers, walkway products and other components of membrane roofing system.
  - 2. Warranty Period: 20 years from date of Substantial Completion.
  
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
  - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE:

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: Provide TPO roofing membrane complying with ASTM D-4434. Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:
  - 1. Available Manufacturers:
    - a. Carlisle SynTec Incorporated.
    - b. Firestone Building Products Company.
    - c. Johns Manville International, Inc.
  
  - 2. Basis of Design: Products as manufactured by Carlisle.
  - 3. Thickness: 60 mils (1.5 mm), nominal.
  - 4. Exposed Face Color: "White."
  - 5. Physical Properties:
    - a. Breaking Strength: 225 lbf (1 kN); ASTM D 751, grab method.
    - b. Elongation at Break: 15 percent; ASTM D 751.
    - c. Tearing Strength: 55 lbf (245 N) minimum; ASTM D 751, Procedure B.
    - d. Brittleness Point: Minus 22 deg F (30 deg C).

- e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch- (75-mm-) diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F (40 deg C) and an ozone level of 100 pphm (100 mPa); ASTM D 1149.
  - f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F (116 deg C); ASTM D 573.
  - g. Water Absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F (70 deg C); ASTM D 471.
  - h. Linear Dimension Change: Plus or minus 2 percent; ASTM D 1204.
6. Fleeceback Membrane: As required to obtain specified warranty and to meet performance requirements.
- a. Fleeceback 115

### 2.3 AUXILIARY MATERIALS:

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
  - 1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 60 mils thick, minimum, of same color as sheet membrane.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.
- D. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
- E. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

### 2.4 ROOF INSULATION:

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
  - 1. Available Manufacturers:
    - a. Apache Products Company.
    - b. Atlas Roofing Corporation.
    - c. Carlisle SynTec Incorporated.
    - d. Celotex Corporation.
    - e. Firestone Building Products Company.

- f. GAF Materials Corporation.
  - g. GenFlex Roofing Systems.
  - h. Hunter Panels, LLC.
  - i. Johns Manville International, Inc.
  - j. RMAX.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
- E. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
- 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
    - a. FAST Adhesive; Carlisle Syntec Systems.
    - b. Dow Insta-Stic, single component, moisture cured, polyurethane insulation adhesive as manufactured by Dow Chemical Company.
    - c. OlyBond 500 Insulation Adhesive; OMG Roofing Products.
    - d. LowRise Foam Insulation Adhesive; Tremco Roofing.

## 2.5 INSULATION ACCESSORIES:

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch (13 mm) thick.
- 1. Product: Subject to compliance with requirements, provide one of the following:
    - a. "Dens-Deck Prime" by Georgia-Pacific Corporation.
    - b. "Securock" by USG.
    - c. "Invinsa" Roof Board by Johns Manville.

## 2.6 WALKWAYS::

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  - 1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
  - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
  - 3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
  - 4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
  - 5. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
  - 6. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 COVER BOARD INSTALLATION:

- A. Install cover board at parapet wall conditions, with long joints running vertically. Tightly butt substrate boards together.
  - 1. Fasten cover board to steel studs according to recommendations in FMG's "Approval Guide" for specified Windstorm Resistance Classification, but not less than 12 inches on center.

3.4 INSULATION INSTALLATION:

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches (50 mm) or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding ¼ inch (6 mm) with insulation.
  - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- G. Mechanically Fastened and Adhered Insulation: At metal deck, without concrete fill, install the first layer of insulation to the metal deck with mechanical fasteners per FMG's "Approval Guide" for specified Windstorm Resistance Classification. Install subsequent layers of insulation at those areas, as required per FM assembly testing, in cold adhesive and to achieve Factory Mutual Windstorm Resistance Classification.
  - 1. Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
  - 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.
  - 1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
  - 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

### 3.5 ADHERED ROOFING MEMBRANE INSTALLATION:

- A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
  - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.



- 3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- I. Install roofing membrane and auxiliary materials to tie in to existing roofing.
- J. Install "peel stop bar" fastened 12 inches on center with acceptable fasteners into the structural deck at the base of parapets, walls, and curbs. Peel stop bar shall also be installed at the base of all tapered edge strips and at transitions, peaks, and valleys according to the roofing system Manufacturer's details.

### 3.6 BASE FLASHING INSTALLATION:

- A. All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed. If any water is allowed to enter under the newly completed roofing, the affected area shall be removed and replaced at the Applicator's expense. Flashings shall be adhered to compatible, dry, smooth surfaces.
- B. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- C. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- D. Flash penetrations and field-formed inside and outside corners with sheet flashing.
- E. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.
- G. All flashings shall be hot-air welded at their joints and at their connections with the roof membrane.

### 3.7 TEMPORARY CUT-OFF

- A. All flashings shall be installed concurrently with the roof membrane in order to maintain a watertight condition as the work progresses. All temporary waterstops shall be constructed to provide a 100 percent watertight seal. The stagger of the insulation joints shall be made even by installing partial panels of insulation. The new membrane shall be carried into the waterstop. The waterstop shall be sealed to the deck and/or substrate so that water will not be allowed to travel under the new or existing roofing.

### 3.8 WALKWAY INSTALLATION:

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### 3.9 FIELD QUALITY CONTROL:

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
  - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- C. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
  - 1. Electric Field Vector Mapping (EFVM): Testing agency shall survey entire roof area for potential leaks using electric field vector mapping (EFVM).
- D. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

**3.10 PROTECTING AND CLEANING:**

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**3.11 ROOFING INSTALLER'S WARRANTY:**

- A. WHEREAS **<Insert name>** of **<Insert address>**, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
  - 1. Owner: **<Insert name of Owner.>**
  - 2. Address: **<Insert address.>**
  - 3. Building Name/Type: **<Insert information.>**
  - 4. Address: **<Insert address.>**
  - 5. Area of Work: **<Insert information.>**
  - 6. Acceptance Date: **<Insert date.>**
  - 7. Warranty Period: **<Insert time.>**
  - 8. Expiration Date: **<Insert date.>**
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

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- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    - a. lightning;
    - b. peak gust wind speed exceeding **72 mph** (32 m/sec);
    - c. fire;
    - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    - f. vapor condensation on bottom of roofing; and
    - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
  2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
  3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
  4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
  5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
  6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
  7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.
- E. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.
1. Authorized Signature: **<Insert signature.>**
  2. Name: **<Insert name.>**
  3. Title: **<Insert title.>**

END OF SECTION 075423

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes sheet metal flashing and trim in the following categories:
  - 1. Exposed trim.
  - 2. Metal flashing.
  - 3. Metal counterflashing and base flashing.
  - 4. Roof-drainage systems.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 07 Section "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Roofing" for installing sheet metal flashing and trim integral with membrane roofing.
  - 2. Division 07 Section "Roof Specialties" for formed aluminum fascia and coping systems.
  - 3. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
  - 4. Division 07 Section "Joint Sealants" for elastomeric sealants.
  - 5. Division 07 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.3 PERFORMANCE REQUIREMENTS:

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

1.4 SUBMITTALS:

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.
- C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

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- D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
  - 1. 8-inch- square Samples of specified sheet materials to be exposed as finished surfaces.
  - 2. 12-inch- long Samples of factory-fabricated products exposed as finished Work. Provide complete with specified factory finish.
  
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE:

- A. Mockups: Prior to installing sheet metal flashing and trim, construct mockups indicated to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
  - 1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
  - 2. Notify Architect one week in advance of the dates and times when mockups will be constructed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 4. Construct mockups for the following type of sheet metal flashing and trim:
    - a. Gutters and downspouts.
    - b. Conductor heads.
    - c. Exposed trim, flashings, and concealed flashings.
    - d. For Each Worker: Soldered samples of laps and end dams to be reviewed and approved by Architect and Commissioning Agent.
  - 5. Obtain Architect's approval of mockups before start of final unit of Work.
  - 6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    - a. When directed, demolish and remove mockups from Project site.
  - 7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PROJECT CONDITIONS:

- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS:

- A. Zinc-Tin Alloy-Coated Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 temper, of minimum uncoated weight (thickness) indicated; coated on both sides with a zinc-tin alloy (50 percent zinc, 50 percent tin).
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Revere Copper Products, Inc.; FreedomGray, or equal.
- B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:
  - 1. High-Performance Organic Finish: AA-C12C42R1x Organic Coating: as specified below. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
      - 1) Color: Custom. Match Architect's sample.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316, dead soft, fully annealed; with smooth, flat surface.
  - 1. Finish: 2D (dull, cold rolled).

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES:

- A. Solder for Zinc-Tin Alloy-Coated Copper: ASTM specification B32 and shall be pure tin OR lead-free, high-tin. Solder containing lead will not be allowed.
- B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
- C. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.
- D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- E. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

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- F. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
- G. Paper Slip Sheet: 5-lb/square red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.
- H. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- thick black polyethylene film, resistant to decay when tested according to ASTM E 154.
- I. Gutter Screen: 1/4-inch hardware cloth installed in sheet metal frames. Fabricate screen and frame of same basic material as gutters and downspouts.
- J. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
- K. Solder:
  - 1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
  - 2. For Zinc-Tin Alloy-Coated Copper: ASTM B 32, 100 percent tin, with 0% lead content as recommended by sheet metal manufacturer.
  - 3. Solder containing lead will not be allowed.
- L. Stainless Steel Downspout Boot: Stainless steel body and 5/16-inch diameter mounting hole for flathead anchor bolts.
  - 1. Product: Model 4" - 5"-26" Downspout Adaptor; Piedmont Pipe Downspout Adapters, tel:(877) 489-0911, or equal.
  - 2. Adaptor to transition from the 4inch by 5inch down spout to 4inch schedule 40 PVC adapter beneath the ground.
  - 3. Length: 26-inches.

**2.3 FABRICATION, GENERAL:**

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

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- D. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  - 1. Seams for Aluminum: Apply EPDM strip across joint with adhesive or releasable tape, and cover with aluminum plate.
  - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- E. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.
- H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
- I. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
  - 1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.4 SHEET METAL FABRICATIONS:

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.
- B. Exposed Trim: Fabricate from the following material:
  - 1. Aluminum: 0.050 inch thick.
- C. Base Flashing: Fabricate from the following material:
  - 1. Zinc-Tin Alloy-Coated Copper: 16.0 oz./sq. ft. (0.0216" thick).
- D. Counterflashing: Fabricate from the following material:
  - 1. Zinc-Tin Alloy-Coated Copper: 16.0 oz./sq. ft. (0.0216" thick).
- E. Flashing Receivers: Fabricate from the following material:



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1. Zinc-Tin Alloy-Coated Copper: 16.0 oz./sq. ft. (0.0216" thick).
- F. Equipment Support Flashing: Fabricate from the following material:
1. Zinc-Tin Alloy-Coated Copper: 16.0 oz./sq. ft. (0.0216" thick).
- G. Roof-Penetration Flashing: Fabricate from the following material:
1. Zinc-Tin Alloy-Coated Copper: 16.0 oz./sq. ft. (0.0216" thick).

**2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS :**

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
1. Gutter Style: J.
  2. Expansion Joints: Butt type.
  3. Joints: Apply EPDM strip accross joint with adhesive or releasable tape, and coover with aluminum plate.
  4. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen.
  5. Gutters with Girth up to 15 Inches: Fabricate from the following material:
    - a. Aluminum: 0.0320 inch (0.81 mm) thick.
  6. Gutters with Girth 16 to 20 Inches ( 410 to 510 mm): Fabricate from the following materials:
    - a. Aluminum: 0.040 inch (1.02 mm) thick.
  7. Gutters with Girth 21 to 25 Inches (530 to 640 mm): Fabricate from the following materials:
    - a. Aluminum: 0.050 inch (1.27 mm) thick.
  8. Gutters with Girth 26 to 30 Inches (660 to 760 mm): Fabricate from the following materials:
    - a. Aluminum: 0.063 inch (1.60 mm) thick.
- B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
1. Fabricate downspouts from the following material:

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- a. Aluminum: 0.063 inch thick.
  - b. Basis-of-Design Product: Subject to compliance with requirements, provide Industrial Downspout, closed face version; Metal Era, or equal.
- C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
- 1. Aluminum: 0.032 inch 0.81 mm thick.
- D. Splash Pans: Fabricate to dimensions and shape required and from the following materials:
- 1. Aluminum: 0.040 inch (1.02 mm) thick.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
  - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 INSTALLATION, GENERAL:**

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
  - 1. Coat side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
  - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

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- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  - 1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
  - 1. Aluminum: Use aluminum or stainless-steel fasteners.
  - 2. Tin-Zinc Alloy-Coated Copper: Use copper or stainless-steel fasteners.
- H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches except where pre-tinned surface would show in finished Work.
  - 1. Do not solder aluminum sheet.
  - 2. Copper Soldering: Tin uncoated copper surfaces at edges of sheets using solder recommended for copper work.
  - 3. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.
- I. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.
- J. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.
- K. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.
- L. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:
  - 1. Turn copper flashing down inside vent piping, being careful not to block vent piping with flashing.
  - 2. Seal and clamp flashing to pipes penetrating roof, other than copper flashing on vent piping.

- M. Install continuous gutter screens on gutters with noncorrosive fasteners, arranged as hinged units to swing open for cleaning gutters.

**3.3 ROOF DRAINAGE SYSTEM INSTALLATION:**

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with butyl sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
  - 1. Fasten gutter spacers to front and back of gutter.
  - 2. Loosely lock straps to front gutter bead and anchor to roof deck.
  - 3. Anchor and loosely lock back edge of gutter to continuous apron flashing.
  - 4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
  - 5. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.
  - 6. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
  - 1. Provide elbows at base of downspout to direct water away from building.
  - 2. Connect downspouts to underground drainage system indicated.
- D. Splash Pans: Install where downspouts discharge on low-sloped roofs. Set in elastomeric sealant compatible with roofing membrane.

**3.4 ROOF FLASHING INSTALLATION:**

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing, 8-inches minimum above roof membrane. Install stainless-steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing, 8-inches minimum above roof membrane. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

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1. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
1. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof.

**3.5 WALL FLASHING INSTALLATION:**

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

**3.6 MISCELLANEOUS FLASHING INSTALLATION:**

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

**3.7 CLEANING AND PROTECTION:**

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Fascia system.
  - 2. Coping system.
  - 3. Fascia drip edge.
  - 4. Roof-drainage systems.
- B. Related Sections include the following:
  - 1. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, gutters and downspouts, trim and fascia units, roof expansion-joint covers, and miscellaneous sheet metal accessories.

1.3 SUBMITTALS:

- A. Product Data: For each type of product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Indicate layout, joining, profiles, accessories, anchorage, flashing connections, and relationship to supporting structure and to adjoining roof and wall construction.
- C. Samples for Initial Selection: Manufacturer's sample finishes showing the full range of colors and textures available for units with factory-applied color finishes.
- D. Samples for Verification: For copings, and roof-edge flashings made from 12-inch (300-mm) lengths of full-size components including fasteners, cover joints, accessories, and attachments.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings and roof-edge flashings.

1.4 PERFORMANCE REQUIREMENTS:

- A. General: Provide manufactured roof specialties capable of withstanding wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

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- B. Edge securement for low-slope roofs. Low-slope membrane roof systems metal edge securement, except gutters, installed in accordance with Oklahoma State Building Code Section 1504, shall be designed in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be as follows:
  - 1. Wind Speed: 120 mph.
- C. Cladding components shall be designed and anchored to resist wind-induced overturning, uplift and sliding in accordance with Oklahoma State Building Code Paragraph 1609.1.3.
  - 1. Wind Speed: 120 mph.

**1.5 QUALITY ASSURANCE:**

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical roof edge, including fascia, gutter and downspout, approximately 10 feet (3.0 m) long, including supporting construction, seams, attachments, underlayment, and accessories.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Preinstallation Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
  - 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
  - 3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

**1.6 DELIVERY, STORAGE, AND HANDLING:**

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

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1.7 WARRANTY:

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Formed-Aluminum Roof Edge Flashings/Copings:
    - a. ABC Seamless, Inc.
    - b. Architectural Products Co.
    - c. ATAS International, Inc.
    - d. Cheney Flashing Company.
    - e. Hickman: W.P. Hickman Co.
    - f. Merchant and Evans, Inc.
    - g. Metal-Era, Inc
    - h. MM Systems Corp.
    - i. Petersen Aluminum Corp.
    - j. Southern Aluminum Finishing Co.
  2. Products manufactured by Metal-Era are specified. Items designated establish minimum requirements for design and performance of equipment required by this Section.

2.2 METALS:

- A. Aluminum Extrusions: ASTM B 221, 6063-T5 alloy and temper, or as recommended by manufacturer for use intended and as required for proper application of finish indicated.



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- B. Aluminum Sheet: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for use intended and finish indicated, and with not less than the strength and durability of alloy and temper designated below:
  - 1. Alloy 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated, for aluminum sheet with mill finish.
- C. Gutter Screen: 1/4-inch hardware cloth installed in sheet metal frames. Fabricate screen and frame of same basic material as gutters and downspouts.

**2.3 ROOF-EDGE FLASHINGS:**

- A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet (3.6 m) and a continuous formed- or extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Model #**AF-70**, Anchor-Tite Standard Fascia; Metal-Era, or one of the listed manufacturers.
  - 2. Height: 7 inches.
  - 3. Extruded bar: Shall be continuous 6063-T6 alloy aluminum at 12 feet 0 inches (3.65 m) standard lengths with pre-punched slotted holes. All bar miters are welded.
    - a. Injection Molded EPDM Bar Splice to allow thermal movement expansion of extruded aluminum anchor bar.
    - b. Fasteners: 2 inch (51 mm) stainless steel with driver.
  - 4. Fascia Cover: Fabricated from the following exposed metal:
    - a. Formed Aluminum: 0.050 inch (1.270 mm) thick.
    - b. Finish: Two-coat fluoropolymer.
  - 5. Corners: Factory mitered and continuously welded.
  - 6. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
- B. Roof-Edge Fascia Drip Edge: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet (3.6 m) and a continuous formed- or extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Model #**AF-DE-75**, Anchor-Tite Drip Edge; Metal-Era, or one of the listed manufacturers.
  - 2. Height: 7 inches.
  - 3. Extruded bar: Shall be continuous 6063-T6 alloy aluminum at 12 feet 0 inches (3.65 m) standard lengths with pre-punched slotted holes. All bar miters are welded.

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- a. Injection Molded EPDM Bar Splice to allow thermal movement expansion of extruded aluminum anchor bar.
  - b. Fasteners: 2 inch (51 mm) stainless steel with driver.
4. Fascia Cover: Fabricated from the following exposed metal:
- a. Formed Aluminum: 0.050 inch (1.270 mm) thick.
  - b. Finish: Two-coat fluoropolymer.
5. Corners: Factory mitered and continuously welded.
6. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.

2.4 COPING:

- A. Coping: Manufactured coping system consisting of decorative formed-metal coping cap with continuous galvanized steel anchor/support in section lengths not exceeding 12 feet (3.6 m), concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.
1. Basis-of-Design Product: **Perma-Tite Gold Coping; Metal-Era**, tel: 604-689-0188, or one of the listed manufacturers.
    - a. Coping-Cap Material: Formed aluminum, 0.063 inch (1.60 mm) thick, or as required to meet performance requirements.
    - b. Finish: Custom, two-coat fluoropolymer.
  2. Fascia vertical face and coping back leg manufactured to job requirements.
  3. Corners: Factory mitered, welded and finished.
  4. Concealed splice plates: 8 inch (203 mm) wide. Finish to match finish of coping cap with factory applied dual non-curing sealant strips.
  5. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material. Mechanically fastened as indicated and detailed.
  6. Snap-on-Coping Anchor Plates: Concealed, 16 ga. galvanized-steel sheet, nominal 12 inches (300 mm) wide, with integral stainless steel spring cleats.

2.5 GUTTERS AND DOWNSPOUTS:

- A. Gutters: Manufactured, in section lengths not exceeding 12 feet (3.6 m).
1. Basis-of-Design Product: Subject to compliance with requirements, provide Type IG1-C8, with flange; Metal-Era, or one of the listed manufacturers.
  2. Height: As indicated on the Drawings.
  3. Length: As indicated on Drawings.
  4. Gutter Straps: 2" x .100 Mill. Preslotted holes in gutter straps.
  5. Aluminum: Formed Aluminum: 0.050 inch (1.27 mm) thick.
    - a. Color: Match standing seam roofing.

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- b. Configuration: Match drawing.
  - c. Provide custom welded miters.
- 6. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen.
- B. Downspouts: Manufactured, in section lengths not exceeding 12 feet (3.6 m).
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Industrial Downspouts; Metal-Era, or one of the listed manufacturers.
  - 2. Size: 3" x 4".
  - 3. Wall Brackets.
  - 4. Length: As indicated on Drawings.
  - 5. Aluminum: Formed Aluminum: 0.050 inch (1.27 mm) thick.
    - a. Color: Match Gutters.
    - b. Configuration: Match drawing.
    - c. Provide custom welded miters.

**2.6 ACCESSORIES:**

- A. General: Provide manufacturer's standard accessories designed and manufactured to match and fit roof edge treatment system indicated.
- B. Concealed Fasteners: Same metal as item fastened or other noncorrosive metal as recommended by manufacturer.
- C. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.
- D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- E. Foam-Rubber Seal: Manufacturer's standard foam.
- F. Adhesives: Type recommended by manufacturer for substrate and project conditions, and formulated to withstand minimum 60-lbf/sq. ft. wind-uplift force.

**2.7 FINISHES, GENERAL:**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Finish manufactured roof specialties after fabrication and assembly if products are not fabricated from prefinished metals.

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- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

**2.8 ALUMINUM FINISHES:**

- A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating or resin manufacturer's written instructions.
  - 1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 1402, Test Method 7.
    - a. Color and Gloss: Custom color. Match Architect's sample.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

- A. Examine walls, roof edges, and parapets for suitable conditions for roof edge system installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

**3.2 PREPARATION:**

- A. Promptly remove protective film, if any, from exposed surfaces of finished metals. Strip with care to avoid damage to finish.
- B. Prepare concrete, concrete masonry block, and similar surfaces to receive roof edge system specified. Install blocking, cleats, water dams, and other anchoring and attachment accessories and devices required.

**3.3 INSTALLATION:**

- A. General: Comply with manufacturer's written installation instructions. Coordinate with installation of roof deck and other substrates to receive work of this Section and with vapor retarders, roofing insulation, roofing membrane, flashing, and wall construction, as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor products securely to structural substrates to withstand lateral and thermal stresses and inward and outward loading pressures.

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- B. Isolation: Where metal surfaces of units contact dissimilar metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces or provide other permanent separation as recommended by aluminum producer.
- C. Expansion Provisions: Install running lengths to allow controlled expansion for movement of metal components in relation not only to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation, or damage.

**3.4 ROOF-EDGE FLASHING INSTALLATION:**

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

**3.5 ROOF-DRAINAGE SYSTEM INSTALLATION:**

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with joints sealed with sealant, and in accordance with manufacturer's details. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
  - 1. Fasten gutter straps to front and back of gutter.
  - 2. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.
  - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
  - 2. Provide elbows at base of downspout to direct water away from building.
  - 3. Connect downspouts to underground drainage system.
- D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant compatible with the substrate.

**3.6 CLEANING AND PROTECTING:**

- A. Clean exposed metal surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

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- B. Protection: Provide protective measures as required to ensure work of this Section will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION 077100

SECTION 077129

MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes:

- 1. Aluminum roof expansion joints.
  - a. Roof to wall.

B. Related Requirements:

- 1. Division 06 Section "Miscellaneous Rough Carpentry" for wooden curbs or cants for mounting roof expansion joints.
- 2. Division 07 Section "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Roofing."
- 3. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.
- 4. Division 07 Section "Roof Accessories" for manufactured and prefabricated metal roof curbs.

1.3 PREINSTALLATION MEETINGS:

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS:

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

B. Shop Drawings: For roof expansion joints.

- 1. Include plans, elevations, sections, and attachment details.
- 2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
- 3. Provide isometric drawings of intersections, terminations, and changes in joint direction or planes, depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.

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- C. Samples: For each exposed product and for each color specified, 6 inches (150 mm) in size.

**1.5 INFORMATIONAL SUBMITTALS:**

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

**1.6 QUALITY ASSURANCE:**

- A. Installer Qualifications: Installer of roofing membrane.

**1.7 WARRANTY:**

- A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof expansion joints that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than five Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: 20 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS:**

- A. General: Roof expansion joints shall withstand exposure to weather, remain watertight, and resist the movements indicated without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.



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- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- C. Fire-Test-Response Characteristics: Provide fire-barrier assemblies with fire-test-response characteristics as determined by testing identical products, per test method indicated, by UL or another testing agency acceptable to authorities having jurisdiction. Assemblies shall be capable of anticipated movement while maintaining fire rating. Fire-barrier products shall bear classification marking of qualified testing agency.

**2.2 ALUMINUM ROOF EXPANSION JOINTS:**

- A. Aluminum Roof Expansion Joint: Manufactured, continuous, waterproof, joint-cover assembly; consisting of a formed or extruded metal cover secured to extruded aluminum frames, with water-resistant gasketing between cover and frames, and with provision for securing assembly to substrate and sealing assembly to roofing membrane or flashing. Provide each size and type indicated, factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation. Fabricate each assembly specifically for installation configuration indicated on Drawings.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
    - b. Balco, Inc.
    - c. C/S Group.
    - d. InPro Corporation.
    - e. MM Systems Corporation.
    - f. Nystrom Building Products.
    - g. Watson Bowman Acme Corp.
  - 2. Joint Movement Capability: Plus and minus 25 percent of joint size.
  - 3. Frame Members: Extruded aluminum configured for curbs as indicated; with exposed finish matching cover.
  - 4. Cover: Formed or extruded aluminum; thickness as recommended by manufacturer.
    - a. Aluminum Finish: High-performance organic.
    - b. Aluminum Finish Color: White.
  - 5. Centering Devices: Centering bars.

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6. Secondary Seal: Continuous, waterproof PVC membrane within joint and attached to substrate on sides of joint below the cover.
  - a. Thermal Insulation: Fill space above secondary seal with mineral-fiber blanket insulation; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.
7. Moisture Barrier: 7 -ply laminate reinforced Polyethylene.
8. Basis of Design: Subject to compliance with requirements, provide the following:
  - a. **[REJ-1]** – C/S SRJW-300. Parapet wall transitions to be provided. (roof/wall joint).

**2.3 MATERIALS:**

- A. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Aluminum: ASTM B 209 (ASTM B 209M) for sheet and plate, ASTM B 221 (ASTM B 221M) for extrusions; alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
  1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious or preservative-treated wood materials.
  2. Mill Finish: As manufactured.
- C. Adhesives: As recommended by roof-expansion-joint manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  1. Adhesives and sealants that are not on the exterior side of air barrier shall comply with Section 018113 Sustainable Design Requirements - Leed for New Construction and Major Renovations – New Construction.
- D. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
  1. Exposed Fasteners: Gasketed. Use screws with hex washer heads matching color of material being fastened.
- E. Mineral-Fiber Blanket: ASTM C 665.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

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- B. Examine roof-joint openings, inside surfaces of parapets, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 INSTALLATION:**

- A. General: Comply with manufacturer's written instructions for handling and installing roof expansion joints.
  - 1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
  - 2. Install roof expansion joints true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
  - 3. Provide for linear thermal expansion of roof expansion joint materials.
  - 4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
  - 5. Provide uniform, neat seams.
  - 6. Install roof expansion joints to fit substrates and to result in watertight performance.
  - 7. Torch cutting of roof expansion joints is not permitted.
  - 8. Do not use graphite pencils to mark aluminum surfaces.
- B. Directional Changes and Other Expansion-Control Joint Systems: Coordinate installation of roof expansion joints with other expansion-control joint systems to result in watertight performance. Install factory-fabricated units at directional changes and at transitions between roof expansion joints and exterior expansion-control joint systems specified in Division 07 Section "Expansion Control" to provide continuous, uninterrupted, and watertight joints.
- C. Splices: Splice roof expansion joints with materials provided by roof-expansion-joint manufacturer for this purpose, to provide continuous, uninterrupted, and waterproof joints.
  - 1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.
- D. Fire Barrier: Install fire barrier where indicated to provide continuous, uninterrupted fire resistance throughout length of roof expansion joint, including transitions and end joints.
- E. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

**3.3 PROTECTION:**

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- A. Protect roof expansion joints from foot traffic, displacement, or other damage.
  
- B. Remove and replace roof expansion joints and components that become damaged by moisture or otherwise.

END OF SECTION 077129

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes sealants for the following applications, including those specified by reference to this Section:
- B. This Section includes sealants for the following applications:
  - 1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
    - a. Control and expansion joints in stucco.
    - b. Control and expansion joints in tilt-up concrete panels.
    - c. Joints between different materials listed above.
    - d. Perimeter joints between materials listed above and frames of doors and windows.
    - e. Other joints as indicated.
  - 2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings where indicated.
    - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
    - e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - f. Other joints as indicated.
- C. Related Sections include the following:
  - 1. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
  - 2. Division 07 Section "Penetration Firestopping" for through-penetration fire-resistant joint-sealant systems.
  - 3. Division 07 Section "Joint Firestopping" for top of wall fire-resistant building joint-sealant systems.
  - 4. Division 08 Section "Glazing" for glazing sealants.
  - 5. Division 09 Section "Gypsum Board" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
  - 6. Division 09 Section "Tiling" for sealing tile joints.

7. Division 09 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS:

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS:

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- H. Field Test Report Log: For each elastomeric sealant application. Include information specified in "Field Quality Control" Article.
- I. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- J. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.
- K. Warranties: Special warranties specified in this Section.

**1.5 QUALITY ASSURANCE:**

- A. **Installer Qualifications:** An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
  
- B. **Source Limitations:** Obtain each type of joint sealant through one source from a single manufacturer.
  
- C. **Preconstruction Compatibility and Adhesion Testing:** Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  - 1. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
    - a. Perform tests under environmental conditions replicating those that will exist during installation.
  
  - 2. Submit not fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  
  - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  
  - 4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
  
  - 5. Testing will not be required if joint sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
  
- D. **Product Testing:** Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
  - 1. **Testing Agency Qualifications:** An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
  
  - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
  
  - 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
  
  - 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
  
- E. **Preconstruction Field-Adhesion Testing:** Before installing elastomeric sealants, field test their adhesion to joint substrates as follows:
  - 1. Locate test joints where indicated or, if not indicated, as directed by Architect.
  
  - 2. Conduct field tests for each application indicated below:
    - a. Each type of elastomeric sealant and joint substrate indicated.

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- b. Each type of nonelastomeric sealant and joint substrate indicated.
  3. Notify Architect seven days in advance of dates and times when test joints will be erected.
  4. Test Method: Test joint sealants by hand-pull method described below:
    - a. Install joint sealants in 60-inch- long joints using same materials and methods for joint preparation and joint-sealant installation required for the completed Work. Allow sealants to cure fully before testing.
    - b. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.
    - c. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
    - d. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
  5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
  6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

**1.6 DELIVERY, STORAGE, AND HANDLING:**

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.



1.7 PROJECT CONDITIONS:

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
  - 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
  - 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY:

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: 20 years from date of Substantial Completion.
- D. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
  - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
  - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS:

- A. Products: Subject to compliance with requirements, provide one of the products indicated for each type in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL:

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
  - 1. Architectural Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS:

- A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
- B. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

2.4 JOINT-SEALANT BACKING:

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

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- B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
  - 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS:

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION:**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

**3.3 INSTALLATION OF JOINT SEALANTS:**

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

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- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
  
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
  
- E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses provided for each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
  
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealants from surfaces adjacent to joint.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

**3.4 FIELD QUALITY CONTROL:**

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed elastomeric sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
    - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
  
  - 2. Test Method: Test joint sealants by hand-pull method described below:
    - a. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.

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- b. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
        - c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
  3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
  4. Inspect tested joints and report on the following:
    - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field- adhesion hand-pull test criteria.
    - b. Whether sealants filled joint cavities and are free from voids.
    - c. Whether sealant dimensions and configurations comply with specified requirements.
  5. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
  6. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- B. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING:

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION:

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.7 ELASTOMERIC JOINT-SEALANT SCHEDULE:

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dow Corning Corporation; 790.
    - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    - c. Pecora Corporation; 890FTS.
    - d. Sika Corporation, Construction Products Division; SikaSil-C990.
    - e. Tremco Incorporated; Spectrem 1.
  2. Color: Custom colors, match architects samples. A different color will be required for each exterior material (brick, CMU, aluminum door frames, aluminum window frames, hollow metal door frames, precast concrete).
  3. Movement Capability: **100** percent movement in extension and **50** percent movement in compression.
  4. Use Related to Exposure: NT (nontraffic).
  5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
    - a. Use O Joint Substrates: Painted aluminum, galvanized steel, and concrete.
  6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
  7. Applications: **Exterior**, horizontal and vertical joints:
    - a. Perimeter joints of aluminum and steel frames in exterior walls.
    - b. Control joints in exterior insulation and finish systems.
    - c. Control joints in concrete masonry.
    - d. Other joints as indicated on Drawings.
- B. Single-Component Nonsag Urethane Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Chem-Calk 900; Bostik Inc.
    - b. Vulkem 116; Tremco.
    - c. Dynatrol I; Pecora Corporation.
    - d. DyMonic; Tremco.
  2. Color: As selected by Architect from manufacturer's standards. A different color will be required for each interior material (brick, CMU, aluminum door frames, aluminum window frames, hollow metal door frames).
  3. Type and Grade: S (single component) and NS (nonsag).
  4. Class: **25**.

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5. Use Related to Exposure: NT (nontraffic).
  6. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
    - a. Use O Joint Substrates: Painted aluminum, galvanized steel, concrete masonry.
  7. Applications: **Interior**, horizontal and vertical joints:
    - a. Perimeter joints of aluminum and steel frames in exterior walls.
    - b. Control joints in concrete masonry.
    - c. Other joints as indicated on Drawings.
- C. Mildew-Resistant Silicone Sealant: Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. 786 Mildew Resistant; Dow Corning.
    - b. Sanitary 1700; GE Silicones.
    - c. 898 Silicone Sanitary Sealant; Pecora Corporation.
    - d. PSI-611; Polymeric Systems, Inc.
    - e. Tremsil 600 White; Tremco.
  2. Color: As selected by Architect from manufacturer's standards. A different color will be required for each type and color plumbing fixture.
  3. Type and Grade: S (single component) and NS (nonsag).
  4. Class: 25.
  5. Use Related to Exposure: NT (nontraffic).
  6. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
    - a. Use O Joint Substrates: Glass, ceramic tile.
  7. Applications: **Interior**, horizontal and vertical joints: Perimeter joints of plumbing fixtures and adjoining walls, floors, and counters. Tile control and expansion joints where indicated.
    - a. Other joints as indicated on Drawings.
- D. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.
1. For joints in vertical **interior** surfaces which are painted, but not limited to:
    - a. Interior trim or finish joints subject to movement.
    - b. Perimeter joints of metal door frames on interior walls.
    - c. Control joints in gypsum board partitions.
    - d. Joints where acoustical sealant is indicated.
    - e. Other joints as indicated on Drawings.



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2. Available Products:

- a. Bostik Findley; Chem-Calk 600.
- b. Pecora Corporation; AC-20+.
- c. Schnee-Morehead, Inc.; SM 8200.
- d. Sonneborn, Division of ChemRex Inc.; Sonolac.
- e. Tremco; Tremflex 834.

END OF SECTION 079200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Exterior entrance systems (thermally broken).
  - 2. Interior entrance systems.
  - 3. Exterior storefront systems (thermally broken).
  - 4. Interior storefront systems.
- B. Related sections include the following:
  - 1. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
  - 2. Division 8 Section "Glazing."
- C. Products installed but not supplied under this Section:
  - 1. Installation of door hardware for aluminum entrances and storefronts. Door Hardware is specified under Division 08 Section "Door Hardware."

1.3 SYSTEM DESCRIPTION:

- A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
  - 1. Air infiltration and water penetration exceeding specified limits.
  - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Thermally Broken Construction: Provide systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.
- D. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
  - 1. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller, unless otherwise indicated.

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2. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
  - a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
  - b. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.
  
- E. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
  1. Provide a minimum 1/8-inch clearance between members and top of glazing or other fixed part immediately below.
  2. Provide a minimum 1/16-inch clearance between members and operable windows and doors.
  
- F. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.
  
- G. Air Infiltration: Provide entrance and storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft..
  
- H. Water Penetration: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft.. Water leakage is defined as follows:
  1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
  
- I. Thermal Movements: Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
  1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
  
- J. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.
  
- K. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.1.
  
- L. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.63 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.
  
- M. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

**1.4 SUBMITTALS:**

- A. **Product Data:** For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. **Shop Drawings:** For entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.
- C. **Samples for Initial Selection:** Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. **Samples for Verification:** Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- E. **Cutaway Sample:** Of each vertical-to-horizontal framing intersection of systems, made from minimum 6-inch lengths of full-size components and showing details of the following:
  - 1. Joinery.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.
  - 5. Flashing and drainage.
- F. **Installer Certificates:** Signed by manufacturer certifying that installers comply with specified requirements.
- G. **Sealant Compatibility and Adhesion Test Reports:** From sealant manufacturer, indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturers' written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- H. **Product Test Reports:** Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of entrance and storefront systems with requirements based on comprehensive testing of current systems.

**1.5 QUALITY ASSURANCE:**

- A. **Installer Qualifications:** Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
  - 1. **Engineering Responsibility:** Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. **Testing Agency Qualifications:** Demonstrate to Architect's satisfaction, based on Architect's evaluation of criteria conforming to ASTM E 699, that the independent testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. **Source Limitations:** Obtain each type of entrance and storefront system, aluminum window system and glazed aluminum curtain wall system through one source from a single manufacturer.

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- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."
- F. Mockups: Before installing entrance and storefront systems, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Architect's approval of mockups before proceeding with installation of systems.
  5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    - a. When directed, demolish and remove mockups from Project site.
    - b. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.6 PROJECT CONDITIONS:

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating systems without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.7 WARRANTY:

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
1. Structural failures including, but not limited to, excessive deflection.
  2. Failure of system to meet performance requirements.
  3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  4. Failure of operating components to function normally.
  5. Water leakage through fixed glazing and frame areas.

- C. Warranty Period: 2 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. Storefront Entry System:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Series "500T" Insulpour wide stile thermal door, "TRIFAB VG - 451T" center glazed, thermal storefront, "TRIFAB VG - 451" non-thermal storefront, Kawneer Company, Inc., or a comparable product by one of the following:
    - a. Series "D-502" wide stile thermal door, "403T" center set, thermal storefront, "402" non-thermal storefront, EFCO Corporation.
    - b. Series "500T" wide stile thermal door, "3000T" center set, thermal storefront, "3000" center set, non-thermal storefront, Oldcastle Building Envelope.
    - c. Series "MegaTherm" 50XT wide stile door, "YES 45 XT" thermal storefront, "Yes 45 FI" non-thermal storefront; YKK AP.

### 2.2 MATERIALS:

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
1. Sheet and Plate: ASTM B 209.
  2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
  3. Extruded Structural Pipe and Tubes: ASTM B 429.
  4. Bars, Rods, and Wire: ASTM B 211.
  5. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.
- C. Glazing as specified in Division 8 Section "Glazing."
- D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
- E. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
- F. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
- G. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."
- H. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.3 COMPONENTS:

- A. Stile Doors: Provide manufacturer's standard 1-3/4 -inch- thick glazed doors with minimum 0.188-inch- thick, extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.
  - 1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets.
  - 2. Stile Design: Wide stile; over 4 inches wide.
  - 3. Bottom Rail: Custom, 6-1/2-inches high.
- B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Reinforce members as required to retain fastener threads.
  - 2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- E. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, complying with ASTM A 666, of type selected by manufacturer for compatibility with system.
- F. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
  - 1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
  - 2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

2.4 HARDWARE:

- A. General: Provide weather stripping indicated in sizes, number, and type recommended by manufacturer for entrances indicated. Finish exposed parts to match door finish, unless otherwise indicated.
- B. Cylinders and Balance of Hardware: As specified in Division 8 Section "Door Hardware."

2.5 FABRICATION:

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
  - 1. Fabricate components for screw-spline frame construction.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.

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- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- I. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
  - 1. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
  - 2. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames.

2.6 ALUMINUM FINISHES:

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
  - 1. Color: Dark bronze.

2.7 STEEL PRIMING:

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.
- B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.



- C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION:

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION:

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Install door hardware as specified in Section 08710 "Door Hardware." Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
  - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
  - 2. Set aluminum thresholds in bed of silicone sealant.
- G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.
  - 1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
  - 2. Install structural silicone sealant according to sealant manufacturer's written instructions.
  - 3. Mechanically fasten glazing in place until structural sealant is cured.
  - 4. Remove excess sealant from component surfaces before sealant has cured.
- H. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

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- I. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
  - 1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.
  - 2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
  - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 ADJUSTING AND CLEANING:

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION:

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084113

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Doors.
  - 2. Glazed entrances.

1.3 DEFINITIONS:

- A. **Manufacturer:** A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. **Interspace:** Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- C. **Deterioration of Coated Glass:** Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. **Deterioration of Insulating Glass:** Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- E. **Deterioration of Laminated Glass:** Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS:

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
    - a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
    - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
      - 1) Load Duration: 60 seconds or less.
    - c. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
      - 1) For monolithic-glass lites heat treated to resist wind loads.
      - 2) For insulating glass.
      - 3) For laminated-glass lites.
    - d. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.

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2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch- wide interspace.
4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
  - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F( W/sq. m x K).
  - b. Solar Heat Gain Coefficient: NFRC 200.
  - c. Solar Optical Properties: NFRC 300.

**1.5 SUBMITTALS:**

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- square Samples for glass.
  1. Coated vision glass.
  2. Fire-rated glass.
  3. Coated spandrel glass.
  4. Insulating glass for each designation indicated.
  5. For each color (except black) of exposed glazing sealant indicated.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:
  1. Coated float glass.
  2. Insulating glass.
  3. Coated spandrel glass.
  4. Glazing sealants.
  5. Glazing gaskets.

- H. SWRI Validation Certificate: For each elastomeric glazing sealant specified to be validated by SWRI's Sealant Validation Program.
- I. Warranties: Special warranties specified in this Section.

**1.6 QUALITY ASSURANCE:**

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.
- C. Source Limitations for Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.
- D. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
- E. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
- F. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- G. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glass type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.
  - 1. Use manufacturer's standard test methods to determine whether priming and other specific preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
    - a. Perform tests under normal environmental conditions replicating those that will exist during installation.
  - 2. Submit not fewer than nine pieces of each type and finish of glass-framing members and each type, class, kind, condition, and form of glass (monolithic, laminated, and insulating units) as well as one sample of each glazing accessory (gaskets, tape sealants, setting blocks, and spacers).
  - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - 4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
  - 5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

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- H. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- I. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- J. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.
1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
  2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft.( 0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft.(0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- K. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
  2. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines."
- L. Mockups: Before glazing, build mockups for each glass product indicated below to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups with the following kinds of glass to match glazing systems required for Project, including typical lite size, framing systems, and glazing methods:
    - a. Fully tempered glass.
    - b. Coated insulating glass.
    - c. Laminated glass.
  2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  3. Obtain Architect's approval of mockups before starting fabrication.
  4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  5. Demolish and remove mockups when directed.
  6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- M. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING:

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS:

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY:

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
    - a. Spandrel Glass: 5 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
  - 1. Warranty Period: 5 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - 1. Warranty Period: 10 years from date of Substantial Completion.



PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS:

- A. Products: Subject to compliance with requirements, provide one of the products indicated in schedules at the end of Part 3.

2.2 PRIMARY FLOAT GLASS:

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 HEAT-TREATED FLOAT GLASS:

- A. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
  2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
  3. For uncoated glass, comply with requirements for Condition A.
  4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
  5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

2.4 COATED FLOAT GLASS:

- A. General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.
1. Provide Kind HS (heat-strengthened) coated float glass in place of coated annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
  2. Provide Kind HS (heat-strengthened) coated float glass, except provide Kind FT (fully tempered) products where coated safety glass is indicated.
- B. Pyrolytic-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide coating applied by pyrolytic deposition process during initial manufacture, and complying with other requirements specified.

- C. **Sputter-Coated Float Glass:** Float glass with metallic-oxide or metallic-nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), complying with requirements specified in schedules at the end of Part 3.
- D. **Ceramic-Coated Spandrel Glass:** ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.
  - 1. **Fallout Resistance:** Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.

**2.5 INSULATING GLASS:**

- A. **Insulating-Glass Units:** Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.
  - 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
- B. **Overall Unit Thickness and Thickness of Each Lite:** Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
- C. **Sealing System:** Dual seal, with primary and secondary sealants as follows:
  - 1. Manufacturer's standard sealants.
  - 2. Color: Gray.
- D. **Spacer Specifications:** Manufacturer's standard spacer material and construction.
  - 1. **Corner Construction:** Manufacturer's standard corner construction.
  - 2. Color: Gray.

**2.6 ELASTOMERIC GLAZING SEALANTS:**

- A. **General:** Provide products of type indicated, complying with the following requirements:
  - 1. **Compatibility:** Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. **Suitability:** Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  - 3. **Colors of Exposed Glazing Sealants:** As selected by Architect from manufacturer's full range for this characteristic.

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- B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
  - 1. Additional Movement Capability: Where additional movement capability is specified in the Glazing Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.

2.7 GLAZING TAPES:

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 804.3 tape, where indicated.

2.8 GLAZING GASKETS:

- A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.

2.9 MISCELLANEOUS GLAZING MATERIALS:

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.10 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS:

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION:

- A. Examine framing glazing, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep system.
  - 3. Minimum required face or edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION:

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

#### 3.3 GLAZING, GENERAL:

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

- G. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

**3.4 TAPE GLAZING:**

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

**3.5 GASKET GLAZING (DRY):**

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET):

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING:

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 PROTECTION AND CLEANING:

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.9 INSULATING-GLASS SCHEDULE:

- A. Insulating Glass Units “**IG-1**”: All new exterior storefront above entrance doors.
1. Classification of Units: Class CBA.
  2. Air Space Width: Nominal ½ inch measured perpendicularly from surfaces of glass lites at unit's edge.
  3. Sealing System: Dual seal, primary and secondary sealants: manufacturer's standard sealants.
  4. Spacer Specifications: Manufacturer's standard metal.
    - a. Desiccant: Either molecular sieve or silica gel or blend of both.
    - b. Corner Construction: Manufacturer's standard corner construction.
    - c. Color of Spacer: Color as selected by Architect from manufacturer's standard colors.
  5. Glass Specifications: Comply with the following requirements:
    - a. Thickness of Each Lite: 6.0 mm.
    - b. Indoor Lite: Type I (transparent glass, flat), Class 1 (clear) float glass.
    - c. Interspace Content: Argon.
    - d. Outdoor Lite: Type I (transparent glass, flat), Class 1 (clear) float glass.
    - e. Low-Emissivity Coating: Vacuum deposition sputtered coating on second surface.
    - f. Nominal Performance Characteristics are as indicated below:
      - 1) Visible Light Transmittance: 64 percent.
      - 2) Visible Light Reflectance Exterior: 12 percent.
      - 3) Winter Nighttime U-Value: 0.24
      - 4) Solar Heat Gain Coefficient: 0.27
      - 5) Light to Solar Gain: 2.37
  6. Product: Solarban 70XL; Vitro Architectural Glass, or accepted equal from one of the following manufacturers subject to compliance with requirements.
    - a. Guardian Industries.
    - b. Viracon.
- B. Insulating Glass Units “**TIG-1**”: All new storefront and entrance doors where safety glazing is required.
1. Classification of Units: Class CBA.
  2. Air Space Width: Nominal ½ inch measured perpendicularly from surfaces of glass lites at unit's edge.
  3. Sealing System: Dual seal, primary and secondary sealants: manufacturer's standard sealants.
  4. Spacer Specifications: Manufacturer's standard metal.
    - a. Desiccant: Either molecular sieve or silica gel or blend of both.
    - b. Corner Construction: Manufacturer's standard corner construction.

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- c. Color of Spacer: Color as selected by Architect from manufacturer's standard colors.
- 5. Glass Specifications: Comply with the following requirements:
  - a. Thickness of Each Lite: 6.0 mm.
  - b. Indoor Lite: Type I (transparent glass, flat), Class 1 (clear) float glass.
    - 1) Kind FT (fully tempered).
  - c. Interspace Content: Argon.
  - d. Outdoor Lite: Type I (transparent glass, flat), Class 1 (clear) float glass.
    - 1) Kind FT (fully tempered).
  - e. Low-Emissivity Coating: Vacuum deposition sputtered coating on second surface.
  - f. Nominal Performance Characteristics are as indicated below:
    - 1) Visible Light Transmittance: 64 percent.
    - 2) Visible Light Reflectance Exterior: 12 percent.
    - 3) Winter Nighttime U-Value: 0.24
    - 4) Solar Heat Gain Coefficient: 0.27
    - 5) Light to Solar Gain: 2.37
- 6. Provide safety glazing labeling.
- 7. Product: Solarban 70XL; Vitro Architectural Glass, or accepted equal from one of the following manufacturers subject to compliance with requirements.
  - a. Guardian Industries.
  - b. Viracon.

**3.10 ELASTOMERIC GLAZING SEALANT:**

- A. Base Polymer: Neutral-curing silicone.
- B. Type: M (multicomponent).
- C. Grade: NS (nonsag).
- D. Class: 25.
- E. Additional Movement Capability: 25 percent movement in extension and 25 percent in compression for a total of 50 percent movement.
- F. Use Related to Exposure: NT (nontraffic).
- G. Uses Related to Glazing Substrates: G, A, and, as applicable to glazing substrates indicated, O.
  - 1. Use O Glazing Substrates: Elastomeric glazing gaskets and glazing accessories.



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**H. Acceptable Manufacturers:**

1. Dow Corning Corporation.
2. General Electric Co., div. of GE Silicones.
3. Pecora Corporation.
4. Sonneborn Building Products Division, ChemRex, Inc.

END OF SECTION 088000

SECTION 092216

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes non-load-bearing steel framing members for the following applications:
  - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
  - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
  - 3. Complete, decorative ceiling cloud assemblies at auditorium capable of withstanding structural and other loads.
- B. Related Sections include the following:
  - 1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
  - 2. Division 07 Section "Thermal Insulation" for insulation installed with Z-shaped furring members.
  - 3. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.
  - 4. Division 09 Section "Gypsum Board Shaft-Wall Assemblies" for non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

1.3 SUBMITTALS:

- A. Product Data: For each type of product indicated.
  - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."
- B. Coordination Drawings: Auditorium cloud reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Show layout, spacings, sizes, thicknesses, and types of metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, accessories, connection details, and attachment to adjoining work.
  - 2. Ceiling suspension system members.

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3. Method of attaching hangers to building structure.
  - a. Furnish layouts for anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48).
6. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

**1.4 QUALITY ASSURANCE:**

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Qualification Data: For professional engineer.

**1.5 CUSTOM GAMING CLOUD FRAMING:**

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
  1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- B. Seismic Standard: Provide custom ceilings designed and installed to withstand the effects of earthquake motions according to the following:
  1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
  2. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

**PART 2 - PRODUCTS**

**2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL:**

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- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
  - 2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.

**2.2 SUSPENSION SYSTEM COMPONENTS:**

- A. Hanger Attachments to Concrete:
  - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
    - a. Type: Cast-in-place anchor, designed for attachment to concrete forms, or Postinstalled, expansion anchor.
  - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (( 4.12-mm)) diameter.
- C. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
    - b. Chicago Metallic Corporation; 640-C Drywall Furring System.
    - c. USG Corporation; Drywall Suspension System.
    - d. CertainTeed Corporation: 1-1/2" Drywall Suspension System and Quickspan Grid System.

**2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES:**

- A. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
  - 1. Steel Studs and Runners:

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- a. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm)(20 gauge).
  - b. Depth: As indicated on Drawings.
2. Dimpled Steel Studs and Runners:
- a. Minimum Base-Metal Thickness: 0.025 inch (0.64 mm) (20 gauge equivalent).
  - b. Depth: As indicated on Drawings.
  - c. Basis of Design: Dietrich UltraSTEEL Framing or one of the following:
    - 1) Viperstud; Marino\WARE.
    - 2) Or equal.
- B. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
  2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
      - 2) MBA Building Supplies; FlatSteel Deflection Track.
      - 3) Steel Network Inc. (The); VertiClip SLD Series.
      - 4) Superior Metal Trim; Superior Flex Track System (SFT).
      - 5) Or equal.
- C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).
- D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
  2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B, structural steel, Grade 33 (Grade 230); 0.0966-inch (2.5-mm), 0.0677-inch (1.7-mm) minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.
  3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Unistrut Corp.
    - b. Flex-Strut, Inc.
    - c. Haydon Corporation.

2.4 AUXILIARY MATERIALS:

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- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
  
- B. Isolation Strip at Exterior Walls: Provide one of the following:
  - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
  - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION:**

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
  
- B. Coordination with Sprayed Fire-Resistive Materials:
  - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
  - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

**3.3 INSTALLATION, GENERAL:**

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING SUSPENSION SYSTEMS:

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  5. Do not attach hangers to steel roof deck.
  6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

**3.5 INSTALLING FRAMED ASSEMBLIES:**

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
  - 1. Space studs as follows:
    - a. Single-Layer Application: 16 inches (406 mm) o.c., unless otherwise indicated.
    - b. Multilayer Application: 16 inches (406 mm) o.c., unless otherwise indicated.
    - c. Tile backing panels: 16 inches (406 mm) o.c., unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb, unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.



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- a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- 6. Curved Partitions:
  - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
  - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches (150 mm) o.c.
- D. Direct Furring:
  - 1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- E. Z-Furring Members:
  - 1. Erect insulation (specified in Division 7 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.
  - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (600 mm) o.c.
  - 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

**3.6 CUSTOM CEILING CLOUDS CONSTRUCTION:**

- A. Identify actual brand name products used for every product, except commodity products specified by performance or description.
- B. Where a product is specified by performance requirements with test methods, and if so specified, provide test reports showing compliance.
- C. Provide manufacturer's product literature for each brand name product.
- D. Provide the manufacturer's certification that the product used on the project complies with the contract documents.
- E. Secure custom ceiling to existing structure in accordance with fabricators Shop Drawings. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

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END OF SECTION 092216

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes the following:
  - 1. Interior gypsum board.
  - 2. Tile backing panels.
  - 3. Acoustical joint sealant.
  - 4. Expanded metal mesh installed behind drywall at security areas.
- B. Related Sections include the following:
  - 1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
  - 2. Division 09 Section "Gypsum Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
  - 3. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 SUBMITTALS:

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE:

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

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- C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install mockups for the following:
    - a. Each level of gypsum board finish indicated for use in exposed locations.
    - b. Each texture finish indicated.
  2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
  3. Simulate finished lighting conditions for review of mockups.
  4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 STORAGE AND HANDLING:

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS:

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL:

- A. Recycled Content: Provide gypsum panel products with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 8 percent by weight.
- B. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD:

- A. General: Complying with ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Gypsum.
    - b. CertainTeed Corporation.
    - c. Continental Building Products, LLC.
    - d. Georgia-Pacific Building Products.
    - e. National Gypsum Company.
    - f. PABCO Gypsum.
    - g. Temple-Inland Building Products by Georgia-Pacific.
    - h. USG.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch (15.9 mm).
  2. Long Edges: Tapered.
- C. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M.
1. Core: 5/8 inch (15.9 mm), Type X.
  2. Long Edges: Tapered.
  3. Surface Abrasion: Meets or exceeds Level 1 requirements.
  4. Surface Indentation: Meets or exceeds Level 1 requirements.
  5. Products: Provide one of the following:
    - a. Fiberrock Abuse-Resistant Interior Panels; United States Gypsum Company.
    - b. Gold Bond Hi-Abuse XP Gypsum Board; National Gypsum.
    - c. Extreme Abuse Resistant Type X Gypsum Board; CertainTeed.
    - d. Tough Rock Abuse-Resistant Interior Panel; Georgia Pacific.
- D. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: 5/8 inch (15.9 mm), Type X.
  2. Long Edges: Tapered.
  3. Products: Provide one of the following:
    - a. Sheetrock Brand Mold Tough VHI, Firecode Core; United States Gypsum Company.
    - b. Gold Bond Hi-Impact XP Gypsum Board; National Gypsum.
    - c. Moisture and Mold Resistant Extra Abuse Type X with M2Tec; CertainTeed.
    - d. DensArmor Plus® Impact-Resistant Interior Panel; Georgia Pacific.

2.3 TILE BACKING PANELS:

- A. Glass-Mat, Water-Resistant Backing Board:
1. Complying with ASTM C 1178/C 1178M.
  2. Products: Provide one of the following:
    - a. "DensShield Tile Backer" by G-P Gypsum.
    - b. "GlasRoc" Brand; CertainTeed.
    - c. "Fiberock Tile Backerboard; United States Gypsum Company.
  3. "eXP Tile Backer;" National Gypsum Company.
  4. Core: 5/8 inch (15.9 mm), Type X.
  5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Cementitious Backer Units: ANSI A118.9.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Custom Building Products; Wonderboard.
    - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
    - c. USG Corporation; DUROCK Cement Board.
  2. Thickness: 5/8 inch.

2.4 TRIM ACCESSORIES:

- A. Corner Trim, Edge Trim, Inside Corner Trim: **NO-COAT copolymer tapered plastic trim with face and joint tape backing as manufactured by CertainTeed**, or equal. Trims shall be engineered for fully bonded adhesive application with joint compound and without mechanical fasteners.
1. Types:
    - a. Wall Corner Trim: NO-COAT Stick.
    - b. Inside Corner: LEVELLINE Flexible Corner.
    - c. Edge Trim: NO-COAT "L" Trim.
    - d. Vaults/Soffits: LEVELLINE Pro Corner, or NO-COAT Flexible Corner.
  2. Install in a full bed of all-purpose or taping joint compound without mechanical fasteners and in accordance with manufacturer's instructions.
  3. Interior Trim: ASTM C 1047.
- B. Metal Trim Accessories: ASTM C 1047.
1. Material: Steel sheet zinc coated by hot-dip process or rolled zinc.

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2. Shapes:
  - a. J-Trim with both face and back flanges; face flange formed to receive joint compound. Use J-trim for edge trim where indicated.
  - b. Expansion (control) joint: One-piece control joint formed with V-shaped slot and removable strip covering slot opening.
3. Products: Provide the following products, or accepted equal subject to compliance with requirements:
  - a. J-Trim: **No. 200-A** metal trim, United States Gypsum Co., or equal.
  - b. Control Joint: **No. 093** control joint, United States Gypsum Co., or equal.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Fry Reglet Corp.
  - b. Gordon, Inc.
  - c. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
4. Z-Reveal Molding: Match #DRMZ-625-625; Fry Reglet.
  - a. Molding Depth: 5/8 inch.
  - b. Reveal Width: Varies. As indicated on drawings.

2.5 JOINT TREATMENT MATERIALS:

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  1. Interior Gypsum Wallboard: Paper.
  2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

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2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
  - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.6 AUXILIARY MATERIALS:

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
  1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from slag wool, or rock wool.
  1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
  2. Where slag-wool-fiber/rock-wool-fiber blanket insulation, or sound attenuation insulation is indicated by the following thicknesses, provide blankets in batt form with thermal resistance indicated:
    - a. Nominal density of 2.5 lb/cu. ft.
      - 1) R-Value: 3.7 per inch of thickness.
      - 2) Recycled Content: Provide blankets with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 85 percent by weight.
    - b. Fiberglass insulation will not be accepted.



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- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
    - b. Grabber Construction Products; Acoustical Sealant GSC.
    - c. Pecora Corporation; AC-20 FTR.
    - d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
    - e. USG Corporation; SHEETROCK Acoustical Sealant.
  2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- G. Flattened, Expanded Metal Security Mesh: 1.33" x 3.2" expanded metal mesh, flattened, #ASM1.5-9F; AMICO Security Products, tel:(800) 366-2642, or approved equivalent by one of the following:
1. McNichols Co.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 APPLYING AND FINISHING PANELS, GENERAL:**

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

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- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

**3.3 APPLYING INTERIOR GYPSUM BOARD:**

- A. Install interior gypsum board in the following locations:
  - 1. Regular Type: As indicated on Drawings.
  - 2. Type X: As indicated on Drawings.
  - 3. Abuse-Resistant Type: As indicated on Drawings.
  - 4. Moisture- and Mold-Resistant Type: As indicated on Drawings.

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**B. Single-Layer Application:**

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
  - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
  - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

**C. Multilayer Application:**

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

- D. Laminating to Substrate:** Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

**3.4 APPLYING TILE BACKING PANELS:**

- A. Water-Resistant Gypsum Backing Board:** Install at showers, tubs, and where indicated. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Glass-Mat, Water-Resistant Backing Panel:** Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

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- C. Areas Not Subject to Wetting: Install moisture resistant-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive tile-backer resistant panels.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

**3.5 INSTALLING TRIM ACCESSORIES:**

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
  - 2. LC-Bead: Use at exposed panel edges.
  - 3. L-Bead: Use where indicated.
  - 4. U-Bead: Use at exposed panel edges.
  - 5. Curved-Edge Cornerbead: Use at curved openings.

**3.6 FINISHING GYPSUM BOARD:**

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile, or acoustical tile.
  - 3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in other Division 9 Sections.
  - 4. Level 5: Where indicated on Drawings.
    - a. Primer and its application to surfaces are specified in other Division 09 Sections.
- E. Glass-Mat Gypsum Board: Finish according to manufacturer's written instructions.

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- F. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

3.7 PROTECTION:

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes surface preparation and field painting of the following:
  - 1. Exposed interior and exterior items and surfaces.
  - 2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
  
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts, hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
  
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Prefinished items include the following factory-finished components:
    - a. New metal lockers.
    - b. Elevator entrance doors and frames.
    - c. Elevator equipment.
    - d. Finished mechanical and electrical equipment.
    - e. Light fixtures.
    - f. Distribution cabinets.
    - g. Switchgear.
    - h. Panelboards.
    - i. Motors and mechanical equipment.
  
  - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Foundation spaces.
    - b. Furred areas.
    - c. Ceiling plenums.
    - d. Utility tunnels.

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- e. Pipe spaces.
  - f. Duct shafts.
  - g. Elevator shafts.
3. Finished metal surfaces include the following:
- a. Anodized aluminum.
  - b. Stainless steel.
  - c. Chromium plate.
  - d. Copper.
  - e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
- a. Valve and damper operators.
  - b. Linkages.
  - c. Sensing devices.
  - d. Motor and fan shafts.
5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
- 1. Division 05 Section "Metal Fabrications" for shop priming ferrous metal.
  - 2. Division 08 Section "Hollow Metal Doors and Frames" for shop priming steel doors and frames.
  - 3. Section 090001 "Schedule of Finishes."
  - 4. Division 09 Section "Gypsum Board" for surface preparation for gypsum board.

**1.3 DEFINITIONS:**

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
- 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  - 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
  - 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
  - 4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
  - 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS:

- A. Product Data: For each paint system specified. Include block fillers and primers.
  - 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
  
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
  - 1. After color selection, the Architect will furnish color chips for surfaces to be coated.
  
- C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
  - 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
  - 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
  - 3. Submit Samples on the following substrates for the Architect's review of color and texture only:
    - a. Concrete: Provide two 4-inch- square samples for each color and finish.
    - b. Concrete Masonry: Provide two 4-by-8-inch samples of masonry, with mortar joint in the center, for each finish and color.
    - c. Painted Wood: Provide two 12-inch- square samples of each color and material on hardboard.
    - d. Ferrous Metal: Provide two 4-inch- square samples of flat metal and two 8-inch- long samples of solid metal for each color and finish.
  
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE:

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
  
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.



1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type).
  - 3. Manufacturer's stock number and date of manufacture.
  - 4. Contents by volume, for pigment and vehicle constituents.
  - 5. Thinning instructions.
  - 6. Application instructions.
  - 7. Color name and number.
  - 8. VOC content.
  
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
  - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS:

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.
  
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.
  
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
  - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.

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B. **Manufacturers Names:** The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:

1. Glidden Professional (GP).
2. Benjamin Moore & Co. (Moore).
3. PPG Industries, Inc. (PPG).
4. Pratt & Lambert, Inc. (P & L)
5. Sherwin-Williams Co. (S-W).
6. California Paints (CP).
7. MDC Wallcoverings (MDC).

**2.2 PAINT MATERIALS, GENERAL:**

A. **Material Compatibility:** Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. **Material Quality:** Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. **Proprietary Names:** Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. **VOC Content:** Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

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- D. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
  2. Restricted Components: Paints and coatings shall not contain any of the following:
    - a. Acrolein.
    - b. Acrylonitrile.
    - c. Antimony.
    - d. Benzene.
    - e. Butyl benzyl phthalate.
    - f. Cadmium.
    - g. Di (2-ethylhexyl) phthalate.
    - h. Di-n-butyl phthalate.
    - i. Di-n-octyl phthalate.
    - j. 1,2-dichlorobenzene.
    - k. Diethyl phthalate.
    - l. Dimethyl phthalate.
    - m. Ethylbenzene.
    - n. Formaldehyde.
    - o. Hexavalent chromium.
    - p. Isophorone.
    - q. Lead.
    - r. Mercury.
    - s. Methyl ethyl ketone.
    - t. Methyl isobutyl ketone.
    - u. Methylene chloride.
    - v. Naphthalene.
    - w. Toluene (methylbenzene).
    - x. 1,1,1-trichloroethane.
    - y. Vinyl chloride.
- E. Colors: Provide the following color selections:
1. **P-[#]: Reference Section 090001 “Schedule of Finishes.”**
  2. **EP-[#]: Epoxy paint. Reference Section 090001 “Schedule of Finishes.”**

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
  - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
  - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION:

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
  - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime.
  - 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.

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- b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
- 3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
  - a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
  - b. Painting Existing Metal Lockers: Surfaces must be clean and dry, and free of dust, grease, oil, silicones, wax and rust. Sand glossy and chipped areas with 400-grit abrasive paper. Wipe clean using detergent solutions or high quality lacquer thinner as recommended by paint manufacturer. Prime bare metal with scheduled primer.
- 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
  - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
  - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

**3.3 APPLICATION:**

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
  - 1. Paint colors, surface treatments, and finishes are indicated in the schedules.
  - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  - 3. Provide finish coats that are compatible with primers used.

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4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
  5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
  2. Omit primer on metal surfaces that have been shop primed and touchup painted.
  3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
  2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
  3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms (electrical, mechanical and data ) and in occupied spaces.

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- F. Mechanical items to be painted include, but are not limited to, the following:
1. Piping, pipe hangers, and supports.
  2. Heat exchangers.
  3. Tanks.
  4. Ductwork.
  5. Insulation.
  6. Accessory items.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Conduit and fittings.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

**3.4 FIELD QUALITY CONTROL:**

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
  2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations

3.5 CLEANING:

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION:

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
  - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE:

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
  - 1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
    - a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.
      - 1) GP: 4160 XXXX Devguard Multi-Purpose Tank and Structural Primer.
      - 2) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
      - 3) PPG: Industrial Rust Inhibitive Steel Primer, Series 7-858.
      - 4) P & L: S 4551 Tech-Gard High Performance Rust-Inhibitor Primer.
      - 5) S-W: Kem Bond High Solids Universal Metal Primer.
      - 6) CP: Everlife Alkyd Red Oxide Metal Primer 22150.
    - b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.0 mils.
      - 1) GP: 4308 XXXX Devguard Alkyd Industrial Gloss Enamel.
      - 2) Moore: Impervo Enamel #133.
      - 3) PPG: Industrial Interior/Exterior Gloss Oil Enamel, Series 7-814.
      - 4) P & L: S 4500 Series Tech-Gard Maintenance Gloss



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- Enamel.
- 5) S-W: Industrial Enamel HS.
- 6) CP: Everlife Urethane Alkyd Enamel 221XX.
- B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:
1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a galvanized metal primer.
- a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
- 1) GP: 4160 XXXX Devguard Multi-Purpose Tank & Structural Primer.
- 2) Moore: IronClad Galvanized Metal Latex Primer #155.
- 3) PPG: Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel, Series 90-709/712.
- 4) P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.
- 5) S-W: Galvite HS.
- 6) CP: Rust Stop Metal Primer/Finish DTM 106X.
- b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
- 1) GP: 4308 XXXX Devguard Alkyd Industrial Gloss Enamel.
- 2) Moore: Impervo Enamel #133.
- 3) PPG: Industrial Interior/Exterior Gloss-Oil Enamel, Series 7-814.
- 4) P & L: S 4500 Series Tech-Gard Maintenance Gloss Enamel.
- 5) S-W: Industrial Enamel HS.
- 6) CP: Everlife Urethane Alkyd Enamel 221XX.

**3.8 INTERIOR PAINT SCHEDULE:**

- A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
1. Flat Acrylic Finish (Ceilings and soffits in dry areas - typical): 2 finish coats over a primer.
- a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
- 1) GP: Lifemaster No VOC Interior Primer 9116-1200.
- 2) Moore: Fresh Start All-Purpose 100 percent Acrylic Primer 023.
- 3) PPG: Speedhide Quick-Drying Interior Latex Sealer, Series 6-2.
- 4) P & L: PRO-HIDE® Gold Interior Low Odor Latex Primer

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- 5) S-W: ProMar 200 Interior Latex Primer, B28W8200.
  - 6) CP: Primer – Prime Choice All Surface 100% Acrylic Enamel Undercoater 50300.
- b. First and Second Coats: Flat, acrylic-latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.
- 1) GP: 1210 XXXX Ultra-Hide Latex Flat Interior Wall Paint.
  - 2) Moore: Regal Wall Satin W215.
  - 3) PPG: Speedhide Interior Wall Flat Latex, Series 6-70.
  - 4) P & L: RedSeal Porcelain Interior Acrylic Latex Wall Coating.
  - 5) S-W: ProMar 200 Flat, B30W200 Series.
  - 6) CP: Fres~Coat Acrylic Flat 533XX.
2. Low-Luster, Acrylic-Enamel Finish [walls]: 2 finish coats over a primer.
- a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
- 1) GP: Lifemaster No VOC Interior Primer 9116-1200.
  - 2) Moore: Fresh Start All-Purpose 100 percent Acrylic Primer 023.
  - 3) PPG: Speedhide Quick-Drying Interior Latex Sealer, Series 6-2.
  - 4) P & L: PRO-HIDE® Gold Interior Low Odor Latex Primer
  - 5) S-W: ProMar 200 Interior Latex Primer, B28W8200..
  - 6) CP: Primer – Prime Choice All Surface 100% Acrylic Enamel Undercoater 50300.
- b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
- 1) GP: 1412 XXXX Ultra-Hide Latex Eggshell Interior Wall & Trim Enamel.
  - 2) Moore: Regal Premium Interior 100 Percent Acrylic Eggshell Finish W319.
  - 3) PPG: Speedhide Interior Eggshell Latex Enamel, Series 6-411.
  - 4) P & L: RedSeal Interior Eggshell Finish.
  - 5) S-W: ProMar 200 Eg-Shel, B20W2200 Series.
  - 6) CP: Fres~Coat 100% Acrylic Egg-Shell 531XX.
3. Semigloss, Epoxy Enamel Finish: Two finish coats over a primer with a total dry film thickness not less than 3.0 mils, excluding primer coat.
- a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2

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- 1) GP: Lifemaster No VOC Interior Primer 9116-1200.
- 2) Moore: Fresh Start All-Purpose 100 percent Acrylic Primer 023.
- 3) PPG: Speedhide Quick-Drying Interior Latex Sealer, Series 6-2.
- 4) P & L PRO-HIDE® Gold Interior Low Odor Latex Primer
- 5) S-W: ProMar 200 Interior Latex Primer, B28W2600.
- 6) CP: ENVIROTECH Zero VOC Interior Primer #64600.

b. First and Second Coats: Interior, semigloss, epoxy enamel.

- 1) GP: 4426 XXXX Tru-Glaze-WB Waterborne Epoxy Semi-Gloss Coating.
- 2) Moore: Super Spec Interior Latex Acrylic Epoxy Coating 256.
- 3) PPG: Pitt-Glaze WB Water Borne Acrylic Epoxy 16-551/16-598 Series.
- 4) P & L No known product meeting VOC 150 gm/l or less.
- 5) S-W: Pro Industrial Hi-Bild WB Catalyzed Epoxy.
- 6) CP: Tuf-On Waterborne Epoxy Gloss Enamel #15XX.

B. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Semigloss, Acrylic-Enamel Finish: One finish coat over an enamel undercoater and a primer.

a. Primer: Quick-drying, rust-inhibitive, acrylic-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.

- 1) GP: Devflex 4020PF Direct to Metal Primer & Flat Finish.
- 2) Moore: P04 Super Spec HP Acrylic Metal Primer.
- 3) PPG: 90-712 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
- 4) P & L Universal Acrylic HP Primer.
- 5) S-W: Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
- 6) CP: Everlife Alkyd Red Oxide Metal Primer 22150.

b. Undercoat: Alkyd, interior enamel undercoat or semigloss, acrylic-latex, interior enamel, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.

- 1) GP: 1416 XXXX Ultra-Hide Latex Semi-Gloss Interior Wall & Trim Enamel.
- 2) Moore: Super Spec 100 % Acrylic Semi-Gloss Enamel 281.

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- 3) PPG: 9-500 Series Pure Performance Semi-Gloss Latex.
  - 4) P & L RedSeal Interior Latex Semi-Gloss Enamel.
  - 5) S-W: Pro Industrial Semi-Gloss, B66-650 Series.
  - 6) CP: Fres~Coat 100% Acrylic Semi-Gloss 563XX.
- c. Finish Coat: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.
- 1) GP: 1416 XXXX Ultra-Hide Latex Semi-Gloss Interior Wall & Trim Enamel.
  - 2) Moore: Super Spec 100 % Acrylic Semi-Gloss Enamel 281.
  - 3) PPG: 9-500 Series Pure Performance Semi-Gloss Latex.
  - 4) P & L RedSeal Interior Latex Semi-Gloss Enamel.
  - 5) S-W: Pro Industrial Semi-Gloss, B66-650 Series.
  - 6) CP: Fres~Coat 100% Acrylic Semi-Gloss 563XX.
- C. Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal:
- 1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
    - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
      - 1) GP: 4020PF Direct to Metal Primer & Flat Finish.
      - 2) Moore: P04 Super Spec HP Acrylic Metal Primer.
      - 3) PPG: Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel, Series 90-709/712.
      - 3) P & L Universal Acrylic HP Primer.
      - 4) S-W: Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
      - 5) CP: Rust Stop Metal Primer/Finish DTM 1061.
    - b. Undercoat: Acrylic, interior enamel undercoat or semigloss, interior, acrylic-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
      - 1) GP: 1416 XXXX Ultra-Hide Latex Semi-Gloss Interior Wall & Trim Enamel.
      - 2) Moore: Super Spec 100 % Acrylic Semi-Gloss Enamel 281.
      - 3) PPG: Speedhide Interior Enamel Wall & Trim Semi-Gloss Acrylic Latex Series 6-500.
      - 4) P & L RedSeal Interior Latex Semi-Gloss Enamel.
      - 5) S-W: Pro Industrial Semi-Gloss, B66-650 Series.
      - 6) CP: Fres~Coat 100% Acrylic Semi-Gloss 563XX.
    - c. Finish Coat: Odorless, semigloss, acrylic, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils.

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- 1) GP: 1416 XXXX Ultra-Hide Latex Semi-Gloss Interior Wall & Trim Enamel.
- 2) Moore: Super Spec 100 % Acrylic Semi-Gloss Enamel 281.
- 3) PPG: Speedhide Interior Enamel Wall & Trim Semi-Gloss Acrylic Latex Series 6-500.
- 4) P & L RedSeal Interior Latex Semi-Gloss Enamel.
- 5) S-W: Pro Industrial Semi-Gloss, B66-650 Series.
- 6) CP: Fres~Coat 100% Acrylic Semi-Gloss 563XX.

D. Exposed Steel Structure and Steel Roof Deck: Provide the following finish over exposed steel structure, steel roof deck and applied fireproofing:

- 1. Eggshell, Latex-Enamel Dry Fog Finish: 2 finish coats over a primer.
  - a. Primer: Spot prime as required.
  - b. Finish Coats: Odorless, eggshell, latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.0 mils.
    - 1) GP: Spraymaster Pro, Uni-Grip-WB Aquacrylic Dryfall Flat Primer & Finish 1280-1200.
    - 2) Moore: Coronado SUPER KOTE 5000 Latex Dry Fall Flat 110 line.
    - 3) PPG: Speedhide Interior Super Tech Acrylic Dry-Fog Flat Latex, Series 6-725.
    - 4) P & L: Enducryl Latex Dry Falls, Series Z5900.
    - 5) S-W: Waterborne Acrylic Dry Fall, B42W2.
    - 6) CP: Latex Dry Fall 37X.

END OF SECTION 099100

SECTION 108400

BIRD CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Electrified tape bird deterrent systems.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Design, fabricate, and install solar powered bird deterrent strips in locations indicated and as directed by the Architect. Shock strip, connectors, supports and accessories shall withstand UV and weather exposure normal to the location where the project is located.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, descriptions, hardware, fittings, and mounting accessories for bird control system.
- B. Shop Drawings: Show materials, fabrication, dimensions, mounting heights, clearances, and installation details for bird control system.
  - 1. Show locations for blocking, reinforcement, and supplementary structural support to be provided by others.
- C. Samples for Initial Selection:
  - 1. Samples of electrified tape colors for election by the Architect.
- D. Samples for Verification: For each of the following products and for full range of color, texture, and pattern variations required, prepared on Samples of size indicated below.
  - 1. Seam, Edge, and Corner Condition: Not less than 12-inch- (300-mm-) long section showing seam, edge, and corner treatment.
  - 2. Exposed Hardware Finishes: Manufacturer's standard-size unit, not less than 3 inches (76 mm) square.
  - 3. Accessories: Manufacturer's full-size unit.
- E. Qualification Data: For Installer.
- F. Maintenance Data: For bird control system to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Licensed or certified by the manufacturer of the bird control system.

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EXTERIOR FACADE RENOVATION**

- B. Mockups: Before installing bird control system, build mockups to demonstrate aesthetic effects and set quality standards for materials, execution, fabrication, and installation.
  - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store bird control system in original shipping containers until ready.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of bird control system in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Where bird control system installation is indicated to fit to other work, verify dimensions of other work by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 BIRD CONTROL SYSTEM:

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Bird Jolt Flat Track; Bird-B-Gone.
  - 2. Bird Shock Flex Track; Bird Barrier America, Inc.
  - 3. Shock Tape Electric Bird Deterrent; Nixalite of America, Inc.
- B. Electrified Tape/Track: UV-stabilized PVC or acrylic base with copper or aluminum wire with pressure sensitive adhesive with peel of backing, or manufacturer's recommended primer and adhesive.
- C. Solar Charging System: Manufacturer's standard, 4.0VDC minimum input voltage, solar charging system.
  - 1. Output Voltage: 7.0 (+/-) 20% open circuit voltage intermittent DC current.
  - 2. Provide battery backup.
- D. Miscellaneous Accessories: Provide manufacturer's standard system of electrical wire connections between tracks and power source.
- E. Mounting System: Manufacturer's standard system of brackets, coils, springs, primers, sealers and adhesives, installed in accordance with manufacturer's written instructions.
  - 1. Complying with performance requirements indicated and suitable for exposure conditions, supporting structure, anchoring substrates, and installation methods indicated. Corrosion-resistant or noncorrodible units; weather-resistant, compatible, nonstaining materials. Provide as required for bird deterrent system mounting and secure attachment. Number as needed to comply with performance requirements and to minimize appearance; evenly spaced. Where exposed to view, with finish and color as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, and other conditions affecting bird deterrent system.
  - 1. Remove bird droppings and debris with manufacturers recommended sanitizers and cleaners.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install bird deterrent system at locations and in position indicated, securely connected to substrate, and in proper relation to adjacent construction. Use mounting methods of types described and in compliance with Shop Drawings and manufacturer's written instructions.
- B. Install bird deterrent system after other finishing operations, including painting, have been completed.
- C. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing bird deterrent system to substrate and for properly transferring load to in-place construction.
- D. Parapets, copings and other locations where width is greater than 6-inches: Provide 2 rows of bird deterrent system and surfaces greater than 10-inches, provide three rows of bird deterrent system.
- E. Adjust components and accessories.

END OF SECTION 108400