

# DTW ADA IMPROVEMENTS, ADULT CHANGING ROOMS + BABY CHANGING COUNTERS

MCNAMARA AND EVANS TERMINALS + WESTIN HOTEL,  
DETROIT METRO AIRPORT  
DETROIT, MI 48242

Project Number: MT906, MT907, NT321  
Issued For: IFB Set  
Date Issued: 09/05/2025

Owner: Wayne County Airport Authority  
Owner Representative: Nicolas Pridnia

Architect: PLY +  
219 N. Main St.  
Ann Arbor, MI 48104

M/E/P Engineer: IMEG Corp  
3353 Twelve Mile Rd  
Farmington Hills, MI. 48331



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**SEALS PAGE**

**ARCHITECTURAL SIGNATURE PAGE**

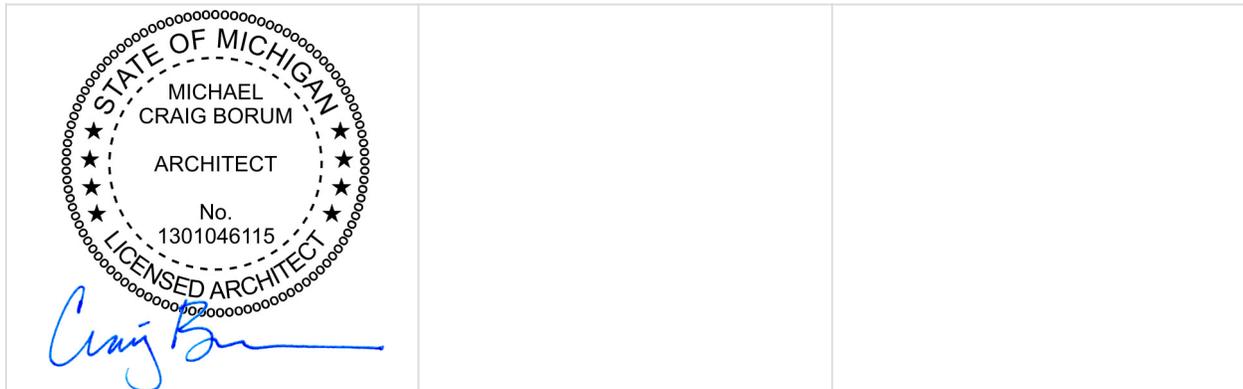
**PLY+ ARCHITECTURE**

**409 1/2 N 4TH AVE,**

**ANN ARBOR, MI. 48104**

**PH. 734.827.2238**

**ARCHITECT: CRAIG BORUM, FAIA**



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**MEP SIGNATURE PAGE**

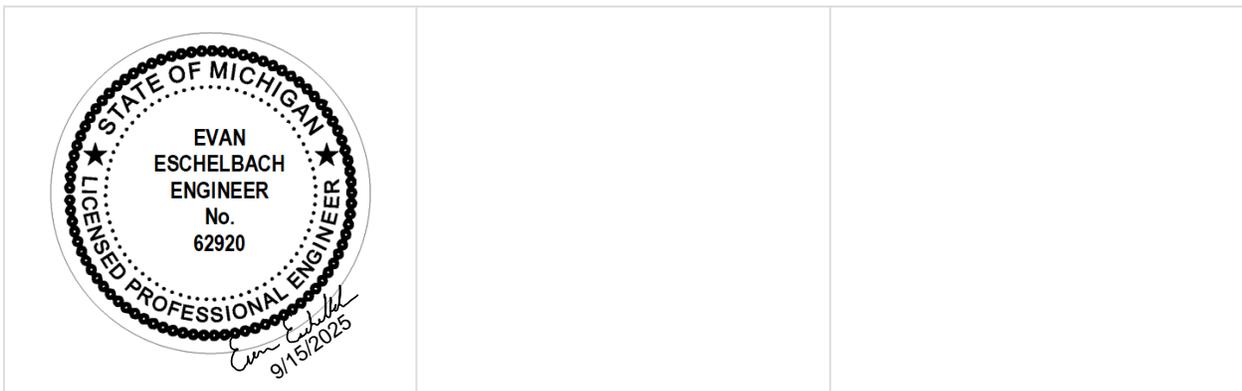
**IMEG CORP.**

**201 S. ANN ARBOR STREET**

**SALINE, MI. 48176**

**PH. 734.316.6571**

**ENGINEER: EVAN ESCHELBACH, P.E.**



**END OF SECTION**

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**SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION**

**SUBSTITUTION REQUEST NUMBER:**

**DATE SUBMITTED:**

**SPECIFIED ITEM:** \_\_\_\_\_

**SPECIFICATION SECTION:** \_\_\_\_\_

**SPEC ARTICLE / PARAGRAPH:** \_\_\_\_\_

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

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

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

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

\_\_\_\_\_

\_\_\_\_\_

**PROPOSED SUBSTITUTION**

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

\_\_\_\_\_

\_\_\_\_\_

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

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

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

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

\_\_\_\_\_

\_\_\_\_\_

**WILL PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF THE WORK?**

YES  NO

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

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**HOW WILL SUBSTITUTION BENEFIT THE OWNER:**

COST SAVINGS     TIME SAVINGS     OTHER

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

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

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

LIST OF REFERENCES WHERE PROPOSED PRODUCT HAS BEEN INSTALLED; INCLUDE ADDRESS, OWNER, ARCHITECT, AND DATE INSTALLED.

PRODUCT DATA SHEETS.

APPLICABLE CERTIFICATES AND TEST REPORTS.

COMPARATIVE DATA: PROVIDE POINT-BY-POINT, SIDE-BY-SIDE COMPARISON OF SPECIFIED PRODUCT AND PROPOSED SUBSTITUTION ADDRESSING ESSENTIAL ATTRIBUTES SPECIFIED.

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

DRAWINGS.

SAMPLES.

OTHER ITEMS: \_\_\_\_\_

**SIGNATURE**

**THE UNDERSIGNED CERTIFIES:**

• PROPOSED SUBSTITUTION HAS BEEN FULLY INVESTIGATED AND DETERMINED TO BE EQUAL OR SUPERIOR IN ALL RESPECTS TO SPECIFIED PRODUCT.

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• **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 / COMPANY** \_\_\_\_\_

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

**EMAIL:** \_\_\_\_\_ **PHONE:** \_\_\_\_\_

**ARCHITECT'S RESPONSE**

**SUBSTITUTION APPROVED - PROVIDE SUBMITTALS PER SECTION 01 33 00 AND RESPECTIVE SECTION FOR WHICH SUBSTITUTION WAS MADE.**

**SUBSTITUTION APPROVED AS NOTED - PROVIDE SUBMITTALS PER SECTION 01 33 00 AND RESPECTIVE SECTION FOR WHICH SUBSTITUTION WAS MADE**

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**SUBSTITUTION REJECTED - PROVIDE SPECIFIED MATERIAL (S)**

**SUBSTITUTION REQUEST RECEIVED TOO LATE - USE SPECIFIED MATERIALS.**

**ARCHITECT'S SIGNATURE:** \_\_\_\_\_

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

**ADDITIONAL COMMENTS:**

**CONTRACTOR**    **SUBCONTRACTOR**    **SUPPLIER**    **MANUFACTURER**    **A/E**

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

**END OF SECTION 006325**

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## SECTION 011000

### SUMMARY

#### PART 1 GENERAL

##### 1.01 PROJECT

- A. Project Name: P24010\_002 DTW ADA Improvements, Adult Changing Rooms and Baby Changing Counters
- B. Owner's Name: WCAA.
- C. Architect's Name: PLY+ Architecture.
- D. Project Summary. The Work consists of targeted ADA improvements at Detroit Metro Airport within the Evans North Terminal, the McNamara International Terminal, and the Westin hotel. Scope includes selective demolition; accessibility upgrades to interior finishes; millwork/casework and countertops; door hardware; adjustments to toilet partitions and compartment accessories; and resetting/mounting heights for plumbing fixtures and restroom accessories (including grab bars, dispensers, mirrors, and controls) to achieve compliant clearances and operable parts; adult-changing/baby-changing accommodations; and the furnishing and installation of ADA-compliant signage per schedules and details, with related patching/restoration and MEP work to support revised locations and heights; and other improvements as indicated on the Drawings. All work shall be phased and coordinated with Terminal Operations; where work can be contained to a single room, only one room per terminal may be closed to the public at any time and the closure shall not exceed 15 days; temporary partitions are required where work occurs in public areas during operating hours.
- E. Project Location: Evans Terminal, Detroit Metro Airport, RomulusMichigan, 48242
- F. Architect Identification: The IFB set, dated 09-05-2025 were prepared for this project by PLY+ Architecture

##### 1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in the contract for construction.

##### 1.03 PROJECT WARRANTY

- A. Refer to General Conditions for warranty provisions applicable to this Contract.

1. Project warranty period is governed by Michigan state statutes and other provisions of the Contract.
- B. Guarantee of Materials and Workmanship:
1. Guarantee in writing to Owner that all work performed and all materials and equipment furnished under this Contract are new and in accordance with the Contract Documents, are free from defects in equipment, materials or design furnished, or workmanship performed by Contractor or any of his subcontractors or suppliers at any tier. Such guarantee shall continue for a period of one (1) year from the date of Substantial Completion of the Work.
  2. Under this guarantee, Contractor agrees to remedy at his own expense any inferior or defective equipment, materials, workmanship, or design that should develop during the guarantee period, or in restoring any other work damaged in fulfilling the terms of the guarantee.
  3. Do not perform any work that shall void any manufacturer guarantee or warranty.
- C. Manufacturer's Guarantee and Warranty:
1. As identified in other Sections of the specifications, provide written manufacturer's guarantees and warranties for specific materials, products, and equipment furnished and installed under this Contract.
  2. Guarantees and Warranties Period: Valid for the period of time stated in each applicable specification Section from the date of Substantial Completion of the Work, but not less than twelve (12) months.
- D. Extended Warranties:
1. As identified in other Sections of the specifications, provide written manufacturer's guarantees and warranties for specific materials, products, and equipment furnished and installed under this Contract.
  2. Guarantees and Warranties Period: Valid for the stated extended period beyond twenty-four (12) months from the date of Substantial Completion of the Work.
- E. Exclusions:
1. Warranty requirements contained in the specifications take precedence. These exclusions are superseded by warranty coverage requirements of the specifications.
  2. Notify Architect of design conditions which cannot be fully warranted. Submit notice in writing prior to purchase of the affected product or system.

3. Failure to provide such notice will not be grounds for waiver of warranty requirements contained in the specifications.
4. Upon receipt of such notice, Architect will consider modifications necessary to assure that final construction is warrantable to the full extent of Contract requirements.

#### **1.04 WORK BY OWNER**

- A. Items noted below shall be supplied by Owner and installed by Contractor before Substantial Completion.
  1. Owner's Responsibilities:
    - a. Furniture, both new and relocated.
    - b. Secure storage shelving.
    - c. Computer workstations.
    - d. Phones and other communication technology.
  2. Contractor's Responsibilities: The work includes the following, as applicable.
    - a. The contractor shall remove and protect existing furniture within the work area as required by phase.
    - b. Ensure access and clearance requirements are met throughout construction as necessary to maintain minimum critical operation of the inspection station suite and all associated rooms.
    - c. Coordinate with Owner appropriate hours of work to access the suite and conduct a majority of renovation scope, working around flight schedules and seating capacity requirements.

#### **1.05 OWNER OCCUPANCY**

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Owner intends to occupy the Work upon Substantial Completion of each area/phase.
- C. Coordinate with Terminal Operations to minimize conflict and to facilitate Owner's operations, security screening activities, and public circulation.
- D.

#### **1.06 CONTRACTOR USE OF SITE AND PREMISES**

- A. Construction Operations: Limited to areas noted on the Drawings and as released by Terminal Operations.

- B. Arrange use of site and premises to allow:
  - 1. Owner occupancy and uninterrupted airport operations.
- C. Provide access to and from site as required by law and by Owner:
  - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
  - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- D. Temporary Partitions: Where Work occurs in publicly accessible areas during operating hours, provide dust-tight, secure temporary partitions as indicated on the Drawings and as directed by Terminal Operations.
- E. Room Closures: Where Work can be contained to a single room, coordinate with Terminal Operations to restrict public access to that room. Only one (1) room per terminal may be restricted at any given time, and once access is restricted, Work in that room shall not exceed fifteen (15) consecutive days.

#### **1.07 WORK SEQUENCE**

- A. Construct the Work in phases during the construction period per Terminal Operations direction.
- B. Sequence activities so that only one room per terminal is restricted at a time; complete all Work in each restricted room within 15 days of access restriction, including patching and cleanup, before proceeding to the next room.
- C. Provide temporary partitions and protection in public areas during operating hours; perform disruptive work during off-hours when required by Owner.
- D. Coordinate construction schedule and operations with Owner and Terminal Operations; provide advance notices and obtain approvals for all closures and access changes.

**END OF SECTION 011000**

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## **SECTION 012500**

### **SUBSTITUTION PROCEDURES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Procedural requirements for proposed substitutions.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 006325 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).

##### **1.03 DEFINITIONS**

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
  - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
    - a. Unavailability.
    - b. Regulatory changes.
  - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
    - a. Substitution requests offering advantages solely to the Contractor will not be considered.

##### **1.04 REFERENCE STANDARDS**

- A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

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

#### **PART 3 EXECUTION**

##### **3.01 GENERAL REQUIREMENTS**

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
  2. Agrees to provide the same warranty for the substitution as for the specified product.
  3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
  4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
  5. Waives claims for additional costs or time extension that may subsequently become apparent.
  6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. A Substitution Request for specified installer constitutes a representation that the submitter:
1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
1. Note explicitly any non-compliant characteristics.
  2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalent
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- E. Limit each request to a single proposed substitution item.

### **3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT**

- A. Submittal Time Restrictions:
1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.
- B. Submittal Form (before award of contract):
1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

### **3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION**

- A. Submittal Form (after award of contract):
  - 1. Submit substitution requests by completing the form in Section 006325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
  - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
  - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
  - 3. Bear the costs engendered by proposed substitution of:
    - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

### **3.04 RESOLUTION**

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

### **3.05 ACCEPTANCE**

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

**END OF SECTION 012500**



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## **SECTION 013000**

### **ADMINISTRATIVE REQUIREMENTS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Progress photographs.
- G. Requests for Interpretation (RFI) procedures.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 013300 - Submittal Procedures
- B. Section 016000 - Product Requirements: General product requirements.

##### **1.03 GENERAL ADMINISTRATIVE REQUIREMENTS**

- A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
  - 1. Requests for Interpretation (RFI).
  - 2. Requests for substitution.
  - 3. Shop drawings, product data, and samples.
  - 4. Test and inspection reports.
  - 5. Design data.
  - 6. Manufacturer's instructions and field reports.
  - 7. Applications for payment and change order requests.
  - 8. Progress schedules.
  - 9. Coordination drawings.
  - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
  - 11. Closeout submittals.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PRECONSTRUCTION MEETING**

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
  - 1. Owner.
  - 2. Architect.
  - 3. Contractor.
- C. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
  - 5. Designation of personnel representing the parties to Contract and Architect.
  - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

**3.02 SITE MOBILIZATION MEETING**

- A. Schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
  - 1. Contractor.
  - 2. Owner.
  - 3. Architect.
  - 4. Contractor's superintendent.
  - 5. Major subcontractors.
- C. Agenda:
  - 1. Use of premises by Owner and Contractor.

2. Owner's requirements.
  3. Construction facilities and controls provided by Owner.
  4. Temporary utilities provided by Owner.
  5. Survey and building layout.
  6. Security and housekeeping procedures.
  7. Schedules.
  8. Application for payment procedures.
  9. Procedures for testing.
  10. Procedures for maintaining record documents.
  11. Requirements for start-up of equipment.
  12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### **3.03 PROGRESS MEETINGS**

- A. Schedule and administer progress meetings at intervals not exceeding 14 days; conduct weekly during critical activities or when requested by Owner.
- B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
1. Contractor.
  2. Owner.
  3. Architect.
  4. Contractor's superintendent.
  5. Major subcontractors.
- D. Agenda:
1. Review minutes of previous meetings.
  2. Review of work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems that impede, or will impede, planned progress.
  5. Review of submittals schedule and status of submittals.
  6. Review of RFIs log and status of responses.

7. Review of off-site fabrication and delivery schedules.
  8. Maintenance of progress schedule.
  9. Corrective measures to regain projected schedules.
  10. Planned progress during succeeding work period.
  11. Maintenance of quality and work standards.
  12. Effect of proposed changes on progress schedule and coordination.
  13. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

#### **3.04 CONSTRUCTION PROGRESS SCHEDULE**

- A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
  1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- C. Within 10 days after joint review, submit complete schedule.
- D. Submit updated schedule with each Application for Payment.

#### **3.05 PROGRESS PHOTOGRAPHS**

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
  1. Foundations in progress and upon completion.
  2. Structural framing in progress and upon completion.
  3. Enclosure of building, upon completion.
  4. Final completion, minimum of ten (10) photos.
- E. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
  1. File Naming: Include project identification, date and time of view, and view identification.

2. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

### **3.06 REQUESTS FOR INTERPRETATION (RFI)**

- A. Definition: A request seeking one of the following:
  1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
  1. Prepare a separate RFI for each specific item.
    - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
  2. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
  1. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
    - a. Approval of submittals (use procedures specified elsewhere in this section).
    - b. Approval of substitutions (see Section - 016000 - Product Requirements)
    - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
- D. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- E. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
- F. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

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### **3.07 SUBMITTAL SCHEDULE**

- A. Submit to Architect for review a schedule for submittals in tabular format.
- B. Reference Section 013300 - Submittal Procedures

### **3.08 SUBMITTALS FOR REVIEW**

- A. Reference Section 013300 - Submittal Procedures

### **3.09 SUBMITTAL PROCEDURES**

- A. General Requirements: Reference 013300 - Submittal Procedures

**END OF SECTION 013000**

## **SECTION 013216**

### **CONSTRUCTION PROGRESS SCHEDULE**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Contractor's Construction Schedule
  - 2. Submittals Schedule
  - 3. Field Conditions Report

##### **1.02 REFERENCE STANDARDS**

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.
- B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2016, with Addendum (2021).

##### **1.03 DEFINITIONS**

- A. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- B. Float: The measure of leeway in starting and completing an activity.
  - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
- C. Fragment: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- D. Major Area: A story of construction, a separate building, or a similar significant construction element.

##### **1.04 SUBMITTALS**

- A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
  - 1. Scheduled date for first submittal.
  - 2. Specification Section number and title.

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3. Submittal category (action or informational).
  4. Name of subcontractor.
  5. Description of the Work covered.
  6. Scheduled date for Architect's final release or approval.
- B. Contractor's Construction Schedule: Submit electronic copy of initial schedule, large enough to show entire schedule for entire construction period.
- C. Field Condition Reports: Submit two copies at time of discovery of differing conditions. One to be distributed to Owner and the other to Architect.

#### **1.05 COORDINATION**

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from parties involved.
  2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

### **PART 2 PRODUCTS**

#### **2.01 SUBMITTALS SCHEDULE**

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
  2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule

#### **2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)**

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of

the Work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
  - 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

### **2.03 REPORTS**

- A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents

## **PART 3 EXECUTION**

### **3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE**

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each progress meeting
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate Actual Completion percentage for each activity
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility
  - 1. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

**END OF SECTION 013216**



## **SECTION 013300**

### **SUBMITTAL PROCEDURES**

#### **PART 1 GENERAL**

##### **1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

##### **1.02 DEFINITIONS**

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.
- C. Submittals for Project Closeout

##### **1.03 SUBMITTAL PROCEDURES**

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
- B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- C. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal.
  - 1. Initial Review: Allow 10 business days (2 weeks) for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 3. Allow 10 business days (2 weeks) for processing each re-submittal.
  - 4. No extension of the Contract Time will be authorized because of failure to transmit submittals in advance of the Work to permit processing.
- D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:
  - a. Project name.
  - b. Name and address of subcontractor.
  - c. Name and address of supplier.
  - d. Name of manufacturer.
- E. Contractor certification:
  1. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
    - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.
- K. Required Submittals: Material submittals will not be required for approval when the material specified is the material proposed for use. Submittals will be required for all assemblies and when coordination with other trades is required for proper installation. A submittal copy for all materials will be included in the closeout document package.

## **PART 2 PRODUCTS**

### **2.01 ACTION SUBMITTALS**

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
  - 1. Number of Copies: Submit one copy of each submittal, unless otherwise indicated. Architect will return a marked up copy as required. When review is complete, return a copy as a Project Record Document.
  - 2. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Manufacturer's catalog cuts.
    - e. Wiring diagrams showing factory-installed wiring.
    - f. Printed performance curves.
    - g. Operational range diagrams.
    - h. Compliance with recognized trade association standards.
    - i. Compliance with recognized testing agency standards.
- C. Warranties: Submit written warranties with Product Data for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - 1. Preparation: Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.

- c. Fabrication and installation drawings.
  - d. Roughing-in and setting diagrams.
  - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
  - f. Shopwork manufacturing instructions.
  - g. Templates and patterns.
  - h. Schedules.
  - i. Notation of coordination requirements.
  - j. Notation of dimensions established by field measurement.
2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  3. 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 40 inches.
- E. Samples: Prepare physical units of materials or products, including the following:
1. Samples for Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- F. Delegated-Design Submittal: Comply with requirements in Division 1 Section "Quality Requirements."
- G. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- H. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A.
- I. Do not Submit Safety Data Sheets (SDS).

## **2.02 INFORMATIONAL SUBMITTALS**

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit one copy of each submittal, unless otherwise indicated. Architect will not return copies.

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."
- B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
  - C. 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.
  - D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
  - E. 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 "Closeout Procedures."
  - F. 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.
  - G. 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.
  - H. 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.

### **2.03 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.

- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
1. Project record documents.
  2. Operation and maintenance data.
  3. Warranties.
    - a. Submit Warranty Information with original Submittal for Review. These will be reviewed again at Project Closeout.
  4. Bonds.

### **PART 3 EXECUTION**

#### **3.01 CONTRACTOR'S REVIEW**

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### **3.02 ARCHITECT'S ACTION**

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
  1. Accepted
  2. Not Accepted - Resubmit
  3. Accepted as Noted
  4. Submit for Record
  5. No Reponse
- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

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D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

**END OF SECTION 013300**



## **SECTION 014000**

### **QUALITY REQUIREMENTS**

#### **PART 1 - GENERAL**

##### **1.01 REFERENCE STANDARDS**

- A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025a.

##### **1.02 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.

##### **1.03 SUMMARY**

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

##### **1.04 DEFINITIONS**

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in

nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
  - 1. Mockups are used for one or more of the following:
    - a. Verify selections made under Sample submittals.
    - b. Demonstrate aesthetic effects.
    - c. Demonstrate the qualities of products and workmanship.
    - d. Demonstrate successful installation of interfaces between components and systems.
    - e. Perform preconstruction testing to determine system performance.
  - 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
  - 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.

#### **1.05 DELEGATED DESIGN SERVICES**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### **1.06 CONFLICTING REQUIREMENTS**

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate,

for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

### **1.07 ACTION SUBMITTALS**

- A. Mockup Shop Drawings:
  - 1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
  - 2. Indicate manufacturer and model number of individual components.
  - 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

### **1.08 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Contractor's quality-control personnel.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Entity responsible for performing tests and inspections.
  - 3. Description of test and inspection.
  - 4. Identification of applicable standards.
  - 5. Identification of test and inspection methods.
  - 6. Number of tests and inspections required.
  - 7. Time schedule or time span for tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.
- D. Reports: Prepare and submit certified written reports and documents as specified.
- E. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

### **1.09 REPORTS AND DOCUMENTS**

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
  2. Project title and number.
  3. Name, address, telephone number, and email address of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement of whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

#### **1.10 QUALITY ASSURANCE**

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

- G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
  - 1. Provide test specimens representative of proposed products and construction.
  - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
  - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
  - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
  - 5. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
  - 6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, 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.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups of size indicated.
  - 2. Build mockups in location indicated or, if not indicated, as directed by Architect or Construction Manager.
  - 3. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.

4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
  5. Demonstrate the proposed range of aesthetic effects and workmanship.
  6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
  8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  10. Demolish and remove mockups when directed unless otherwise indicated.
- K. Specialty Mockups: See Section 01 4339 "Mockups" for additional construction requirements for integrated exterior mockups.

#### **1.11 QUALITY CONTROL**

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection 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.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Engage a qualified testing agency to perform quality-control services.
    - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. 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 inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

#### **1.12 SPECIAL TESTS AND INSPECTIONS**

- A. Special Tests and Inspections: Owner will coordinate with Construction Manager to engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
  - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.

2. Notifying Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

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

## **PART 3 - EXECUTION**

### **3.01 TEST AND INSPECTION LOG**

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, Construction Manager's and authorities' having jurisdiction reference during normal working hours.
  1. Submit log at Project closeout as part of Project Record Documents.

### **3.02 REPAIR AND PROTECTION**

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
  1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible

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as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

**END OF SECTION 014000**

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## **SECTION 015000**

### **TEMPORARY FACILITIES AND CONTROLS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

##### **1.02 TEMPORARY UTILITIES**

- A. Owner will provide the following:
  - 1. Electrical power, consisting of connection to existing facilities.
  - 2. Water supply, consisting of connection to existing facilities.
- B. Existing facilities may be used.

##### **1.03 TELECOMMUNICATIONS SERVICES**

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
  - 1. Phone and Email: Account/address reserved for project use.

##### **1.04 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is permitted.
- C. Maintain daily in clean and sanitary condition.
- D. At end of construction, return facilities to same or better condition as originally found.

### **1.05 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

### **1.06 INTERIOR ENCLOSURES**

- A. Provide temporary partitions as indicated separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

### **1.07 SECURITY**

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

### **1.08 VEHICULAR ACCESS AND PARKING**

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Existing parking areas may be used for construction parking.

### **1.09 WASTE REMOVAL**

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

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- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

#### **1.10 PROJECT IDENTIFICATION**

- A. Provide project identification sign of design and construction indicated on drawings.
- B. Erect on site at location indicated.
- C. No other signs are allowed without Owner permission except those required by law.

#### **1.11 FIELD OFFICES**

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 10 persons.

#### **1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.

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

#### **PART 3 EXECUTION - NOT USED**

**END OF SECTION 015000**



## **SECTION 016000**

### **PRODUCT REQUIREMENTS**

#### **PART 1 - GENERAL**

##### **1.01 RELATED DOCUMENTS**

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

##### **1.02 SUMMARY**

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Section includes administrative and procedural requirements for substitutions.

##### **1.03 DEFINITIONS**

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
  - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model

number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
  2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

#### 1.04 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form:
    - a. Use CSI Form 1.5C during bidding phase.
    - b. Use CSI Form 13.1A after bidding phase.
  2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication, or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.
    - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
    - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
    - i. Research reports evidencing compliance with building code in effect for Project, from ICC- ES.

- j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### **1.05 QUALITY ASSURANCE**

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

- C. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
  2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power- operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
    - a. Name of product and manufacturer.
    - b. Model and serial number.
    - c. Capacity.
    - d. Speed.
    - e. Ratings.
  3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

#### **1.06 COORDINATION**

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.
- B. Revise or adjust affected work as necessary to integrate work of the approved substitutions.

#### **1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
  2. Store products to allow for inspection and measurement of quantity or counting of units.
  3. Store materials in a manner that will not endanger Project structure.
  4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
  5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  7. Protect stored products from damage and liquids from freezing.

#### **1.08 PRODUCT WARRANTIES**

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. **Manufacturer's Warranty:** Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
  2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

## **PART 2 - PRODUCTS**

### **2.01 PRODUCT SELECTION PROCEDURES**

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
  1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
  6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
    - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.
- B. Product Selection Procedures:
  1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

- a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
  - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
  - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
  - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
  - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

- a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
  - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 2500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## **2.02 COMPARABLE PRODUCTS**

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type,

function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.

3. Evidence that proposed product provides specified warranty.
  4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
  5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 3300 "Submittal Procedures."
1. Form of Approval of Submittal: As specified in Section 01 3300 "Submittal Procedures."
  2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

### **2.03 SUBSTITUTIONS**

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Substitution request is fully documented and properly submitted.
    - c. Requested substitution will not adversely affect Contractor's construction schedule.
    - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - e. Requested substitution is compatible with other portions of the Work.
    - f. Requested substitution has been coordinated with other portions of the Work.
    - g. Requested substitution provides specified warranty.





## **SECTION 017000**

### **EXECUTION AND CLOSEOUT REQUIREMENTS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Cutting and patching.
- D. Cleaning and protection.
- E. Starting of systems and equipment.
- F. Demonstration and instruction of Owner personnel.
- G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- H. General requirements for maintenance service.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 015000 - Temporary Facilities and Controls: Temporary interior partitions.
- B. Section 017419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- C. Section 024100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

##### **1.03 REFERENCE STANDARDS**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022.

##### **1.04 PROJECT CONDITIONS**

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

## **PART 2 PRODUCTS**

### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 PREPARATION**

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

### **3.03 GENERAL INSTALLATION REQUIREMENTS**

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

### **3.04 ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only
  - 1. Verify that construction and utility arrangements are as indicated.
  - 2. Report discrepancies to Architect before disturbing existing installation.
  - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
  - 1. Provide, erect, and maintain temporary dustproof partitions of construction
- C. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction as required.
  - 2. Remove items indicated on drawings.
  - 3. Relocate items indicated on drawings.
  - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, or extend existing systems to accommodate new construction.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
  3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    - b. Provide temporary connections as required to maintain existing systems in service.
  4. Verify that abandoned services serve only abandoned facilities.
  5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
  2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
- G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.

2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
  - I. Clean existing systems and equipment.
  - J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
  - K. Do not begin new construction in alterations areas before demolition is complete.
  - L. Comply with all other applicable requirements of this section.

### **3.05 CUTTING AND PATCHING**

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
  1. Complete the work.
  2. Fit products together to integrate with other work.
  3. Provide openings for penetration of mechanical, electrical, and other services.
  4. Match work that has been cut to adjacent work.
  5. Repair areas adjacent to cuts to required condition.
  6. Repair new work damaged by subsequent work.
  7. Remove samples of installed work for testing when requested.
  8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.

J. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

**3.06 PROGRESS CLEANING**

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

**3.07 PROTECTION OF INSTALLED WORK**

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

### **3.08 DEMONSTRATION AND INSTRUCTION**

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

### **3.09 ADJUSTING**

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

### **3.10 FINAL CLEANING**

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

### **3.11 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect and Owner.
- B. Accompany Architect on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Substantial Completion

1. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
    - a. 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.
    - b. Advise Owner of pending insurance changeover requirements.
    - c. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
    - d. Obtain and submit releases permitting Owner unrestricted use of the Work and access to
    - e. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
    - f. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
    - g. Make final changeover of permanent locks and deliver keys to Owner.
    - h. Complete startup testing of systems.
    - i. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
    - j. Complete final cleaning requirements, including touchup painting.
    - k. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
  2. Final Review: Submit a written request of Final Review for Substantial Completion. On receipt of request, Architect will either proceed with review or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after the review or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued
- D. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- E. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in

accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

- F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- I. Final Completion
  - 1. Preliminary Procedures: Before requesting final review for determining date of Final Completion, complete the following:
    - a. Submit certified copy of Architect's Substantial Completion review 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.
    - b. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
    - c. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- J. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

### **3.12 PROJECT RECORD DOCUMENTS**

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings
  - 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual

or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

- a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
  - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. 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.
  3. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
  4. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy 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. Note related Change Orders and Record Drawings, where applicable.
- D. Miscellaneous Record Submittals: 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

### **3.13 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.
- F. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows
  - 1. Operation Data: Include emergency instructions and procedures, system and equipment descriptions, operating procedures, and sequence of operations.
  - 2. Maintenance Data: Include manufacturer's information, list of spare parts, maintenance procedures, maintenance and service schedules for preventive and routine maintenance, and copies of warranties and bonds.
- G. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets.  
Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

### **3.14 WARRANTIES**

- A. 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 paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

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P24010\_002 DTW ADA  
IMPROVEMENTS, ADULT  
CHANGING ROOMS AND BABY  
CHANGING COUNTERS  
Romulus, Michigan

P24010-002

IFB Set

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- B. Provide additional copies of each warranty to include in operation and maintenance manuals.
- C. Submit Warranties with initial Product Data for Submittal Review. See Section 013300 - Submittal Procedures

**END OF SECTION 017000**

## SECTION 017419

### CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

#### PART 1 GENERAL

##### 1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner desires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
  - 1. Aluminum and plastic beverage containers.
  - 2. Corrugated cardboard.
  - 3. Wood pallets.
  - 4. Clean dimensional wood.
  - 5. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
  - 6. Fluorescent lamps (light bulbs).
- E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- F. Methods of trash/waste disposal that are not acceptable are:
  - 1. Burning on the project site.
  - 2. Burying on the project site.
  - 3. Dumping or burying on other property, public or private.
  - 4. Other illegal dumping or burying.
  - 5. Incineration, either on- or off-site.
- G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

## 1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

## 1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
  - 1. This definition also includes trash and waste generated by construction workers and Contractor's personnel while engaged in the work and on lunch and other breaks, including but not limited to items such as lunch bags, food wrappers, drinking cups, and similar trash and waste.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

#### **1.04 SUBMITTALS**

- A. See Section 013300 - Submittal Procedures , for submittal procedures
- B. Submit Waste Management Plan within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.
- C. Waste Management Plan: Include the following information:
  - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
  - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
  - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
    - a. List each material proposed to be salvaged, reused, or recycled.
    - b. List the local market for each material.
    - c. State the estimated net cost, versus landfill disposal.
  - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.

5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
  6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
- D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
  2. Submit Report on a form acceptable to Owner.
  3. Landfill Disposal: Include the following information:
    - a. Identification of material.
    - b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
    - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  4. Recycled and Salvaged Materials: Include the following information for each:
    - a. Identification of material, including those retrieved by installer for use on other projects.
    - b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
    - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
  5. Material Reused on Project: Include the following information for each:

- a. Identification of material and how it was used in the project.
- b. Amount, in tons or cubic yards (cubic meters).
- c. Include weight tickets as evidence of quantity.
6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

### **PART 3 EXECUTION**

#### **2.01 WASTE MANAGEMENT PROCEDURES**

- A. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

#### **2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
  1. Prebid meeting.
  2. Preconstruction meeting.
  3. Regular job-site meetings.
  4. Job safety meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
  1. As a minimum, provide:

- a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
  - b. Separate dumpsters for each category of recyclable.
  - c. Recycling bins at worker lunch area.
2. Provide containers as required.
  3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
  4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
  5. Locate enclosures out of the way of construction traffic.
  6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
  8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

**END OF SECTION 017419**

## **SECTION 024119**

### **SELECTIVE DEMOLITION**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### **1.02 REFERENCES**

- A. American National Standards Institute/American Society of Safety Engineers
  - 1. ANSI/ASSE A10.6: Safety Requirements for Demolition Operations
- B. NFPA
  - 1. NFPA 241: Safeguarding Construction, Alteration, and Demolition Operations

##### **1.03 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: Carefully detach from existing construction, in a manner to prevent damage, and store for reuse in Project.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

##### **1.04 MATERIALS OWNERSHIP**

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

##### **1.05 COORDINATION**

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

- B. Coordinate demolition activities with the construction phasing plan shown on Drawings. Maintain access, utilities, and safe conditions in areas to remain occupied during phased construction

#### **1.06 PREINSTALLATION MEETINGS**

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

#### **1.07 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For demolition firm.
- B. Qualification Data: For refrigerant recovery technician.
- C. Proposed Protection Measures: Submit report, including any diagrams, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.
- D. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs
  - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before Work begins.

F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

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

#### **1.08 QUALITY ASSURANCE**

A. Demolition Firm Qualifications: Company specializing in the type of work required.

1. Minimum of 5 years of documented experience.

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

#### **1.09 PROJECT CONDITIONS**

A. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 5 working days' notice of activities that will affect operations of adjacent occupied buildings.

2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

3. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

B. Verify existing conditions and notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the work

1. Hazardous materials will be removed by Owner before start of the Work.

2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

#### **1.10 WARRANTY**

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

1. Coordinate with Owner for list of existing warranties still in effect.

## **PART 2 - PRODUCTS**

### **2.01 PERFORMANCE REQUIREMENTS**

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

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 PREPARATION**

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

### **3.03 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS**

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

### **3.04 PROTECTION**

- A. Temporary Protection: Provide temporary barricades and 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.
    - a. Erect temporary pathways and means of egress necessary for ongoing operations compliant with Code and accessibility regulations.
    - b. Provide temporary barricades and protection required to prevent injury and damage to adjacent buildings and facilities to remain.
  2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
    - a. Protect existing work which becomes exposed during demolition operations.
    - b. Protect adjacent entrances from damage due to demolition activities.
    - c. Protect existing improvements, appurtenances, and conditions to remain.
    - d. Protect floors with covering.
    - e. Protect walls, openings, roofs, and adjacent exterior construction to remain and exposed from demolition operations.
  3. Cover and protect furniture, furnishings, and equipment that have not been removed.
  4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01.
- B. Temporary Partitions and Enclosures: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
1. Construct dustproof partitions of not less than nominal 4-inch (100mm) studs, 5/8-inch (16mm) gypsum board with joints taped on occupied side, and 1/2 inch (12.7 mm) fire retardant plywood on the demolition side.
  2. Insulate partition to provide noise protection to occupied areas.
  3. Seal joints and perimeter to prevent dust from migrating to occupied areas.
  4. Equip partitions with dustproof doors and security locks.
  5. Protect air handling equipment.
- 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.
- D. Remove temporary barricades and protections where hazards no longer exist.

### **3.05 SELECTIVE DEMOLITION, GENERAL**

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  5. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Fire Prevention and Mitigation:
1. Contractor shall execute a Hot Work Permit prior to start of cutting torch work and identify all necessary mitigation strategies to ensure fire events do not occur.
  2. Cutting torch work shall be completed by qualified personnel trained in fire prevention and in the use of portable fire-suppression devices.
  3. Do not use cutting torches until work area is cleared of flammable materials.
  4. Maintain portable fire-suppression devices during flame-cutting operations.
  5. Maintain fire watch during and for at least 8 hours after flame-cutting operations.
  6. Maintain adequate ventilation when using cutting torches.

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

### **3.06 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS**

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19.05 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."
- F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See applicable Division 07 Section for new roofing requirements.
  - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
  - 2. Remove existing roofing system down to substrate.

### **3.07 DISPOSAL OF DEMOLISHED MATERIALS**

- A. General: Except for items or materials indicated to be recycled, 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.

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2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01.

### **3.08 CLEANING**

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

**END OF SECTION 024119**



## SECTION 033000

### CAST-IN-PLACE CONCRETE

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Cast-in-place concrete, including concrete materials, mixture design, and finishes.
- B. Steel reinforcement bars and welded-wire reinforcement.
- C. Concrete formwork.

##### 1.02 SUBMITTALS

- A. Product Data: For each type of product and material.
- B. Design Mixtures: For each concrete mixture.
  - 1. Include indication where each mix design will be used.
  - 2. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Shop Drawings:
  - 1. Construction Joint Layout:
    - a. Indicate proposed construction joints required to construct the structure.
      - 1) Location of construction joints is subject to approval of the Architect.
  - 2. Concrete Reinforcement:
    - a. Include placing drawings that detail fabrication, bending, and placement.
    - b. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for
- D. Qualification Data: For the following:
  - 1. Installer: Include copies of applicable ACI certificates.
  - 2. Ready-mixed concrete manufacturer.
  - 3. Testing and inspection agency: Include copies of applicable ACI certificates.
- E. Welding certificates.
  - 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Steel reinforcement and accessories.
4. Form materials and form-release agents.
5. Floor and slab treatments.
6. Bonding agents.
7. Vapor retarders.
8. Joint-filler strips.
9. 9. Repair materials.

G. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Aggregates.
4. Admixtures:
5. Steel Reinforcement.

H. Field quality-control reports.

**1.03 QUALITY ASSURANCE**

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment; with not less than 5 years of documented experience.
1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years of documented experience.
- C. Obtain permeability-reducing (moisture vapor reduction) admixture from a single manufacturer.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- E. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with ASTM C94/C94M and ACI 301.
- B. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
  - 1. Store reinforcement to avoid contact with earth.

#### **1.05 FIELD CONDITIONS**

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
  - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 3. Do not use frozen materials or materials containing ice or snow.
  - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
  - 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
  - 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade

### **PART 2 PRODUCTS**

#### **2.01 PERFORMANCE REQUIREMENTS**

- A. Concrete:
  - 1. Comply with ACI 301 unless modified by requirements in the Contract Documents.
    - a. Provide construction and movement joints required to construct the structure in accordance with ACI 301.
      - 1) Location of construction joints is subject to approval of the Architect
  - 2. Concrete Reinforcement shall comply with ACI SP-066.

## **2.02 FORM-FACING MATERIALS**

- A. Exposed Surface Form-Facing Material: Smooth as-cast surface form-facing material.
  - 1. Provide continuous, true, and smooth concrete surfaces.
  - 2. Furnish in largest practicable sizes to minimize number of joints.
  - 3. Acceptable Materials: As required to comply with Surface Finish designations specified and as follows:
    - a. Plywood, metal, or other approved panel materials.
    - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      - 1) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
      - 2) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
      - 3) APA Plyform Class I, B-B or better; mill oiled and edge sealed.
- B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
  - 1. Provide lumber dressed on at least two edges and one side for tight fit.

## **2.03 RELATED FORMWORK MATERIALS**

- A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
  - 2. Form release agent for form liners shall be acceptable to form liner manufacturer.

## **2.04 CONCRETE MATERIALS**

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

- B. Cementitious Materials:
1. Portland Cement: ASTM C150/C150M, Type I, gray or white.
  2. Fly Ash: ASTM C618, Class C or F.
- C. Normal-Weight Aggregates: ASTM C33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 1/2 inch nominal, unless otherwise indicated.
  2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C260.
- E. Permeability-Reducing (Moisture Vapor Reduction) Admixture: ASTM C494, Type S, hydrophilic, permeability-reducing crystalline admixture, capable of reducing water absorption of concrete exposed to hydrostatic pressure (PRAH); formulated to permanently close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
1. Water Vapor Permeance: Comply with one or more of the following:
    - a. 0.03 perms, maximum, when tested in accordance with ASTM E96.
    - b.  $6 \times 10^{-8}$  cm/s, maximum, in accordance with ASTM D5084.
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Barrier One, Inc; CPS Admix - Moisture Vapor Reduction Admixture (MVRA): [www.barrierone.com](http://www.barrierone.com).
    - b. ISE Logik Industries, Inc; MVRA 900: [www.iselogik.com](http://www.iselogik.com).
    - c. Specialty Products Group; Vapor Lock 20/20: [www.spggogreen.com](http://www.spggogreen.com).
- F. Other Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C494, Type A.
  2. Retarding Admixture: ASTM C494, Type B.
  3. Water-Reducing and -Retarding Admixture: ASTM C494, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
  5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C1017, Type II
- G. Water and Water Used to Make Ice: ASTM C94, potable.

## **2.05 STEEL REINFORCEMENT**

- A. Fabricating Reinforcement
  - 1. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- B. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- C. Steel Bar Mats: ASTM A184, fabricated from ASTM A615, Grade 60, deformed bars, assembled with clips.
- D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064, plain, fabricated from as-drawn steel wire into flat sheets.

## **2.06 REINFORCEMENT ACCESSORIES**

- A. Joint Dowel Bars: ASTM A615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
  - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
    - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
  - 1. Finish: Plain.

## **2.07 CURING MATERIALS**

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
  - 1. Color:
    - a. Ambient Temperature Below 50 deg F: Black.
    - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
    - c. Ambient Temperature Above 85 deg F: White.
- C. Water: Potable or complying with ASTM C1602/C1602M.

## **2.08 CONCRETE MIXTURES, GENERAL**

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
  - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
  - 1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

## **2.09 RELATED MATERIALS**

- A. Bonding Agents: Provide one or more of the following:
  - 1. Latex Bonding Agent: ASTM C1059, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
  - 2. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to
    - a. Types I and II, nonload bearing and Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- B. Expansion- and Isolation-Joint-Filler Strips:
  - 1. Size and Configuration: Unless otherwise indicated, 1/2 inch thick by height equal to slab thickness, optionally with removable top section that will form 1/2 inch deep sealant pocket after removal.
  - 2. Materials: Provide products manufactured from one or more of the following:
    - a. Cellulose fiber, ASTM D1751.
    - b. PVC (Type IV), ASTM D1752.
    - c. Semi-rigid, closed-cell polypropylene foam ASTM D8139.

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. Oscoda Plastics, Inc; Proflex Vinyl Expansion Joints: [www.oscodaplastics.com](http://www.oscodaplastics.com).
  - b. W. R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap:  
[www.wrmeadows.com](http://www.wrmeadows.com).
  - c. W. R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip:  
[www.wrmeadows.com](http://www.wrmeadows.com).

## **2.10 REPAIR MATERIALS**

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from from 1/8 inch and that can be feathered at edges to match adjacent floor elevations. For use at floor slab areas beneath a floor finish covering.
  1. Cement Binder: ASTM C150 portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
  2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  4. Compressive Strength: Not less than 4000 psi at 28 days when tested in accordance with ASTM C109.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations. For use at exposed floor slab areas that will not have a floor finish covering.
  1. Cement Binder: ASTM C150 portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
  2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
  4. Compressive Strength: Not less than 4000 psi at 28 days when tested in accordance with ASTM C109/C109M.

## 2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
  - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
  - 2. Total Fly Ash and Pozzolan: 25 percent by mass.
- C. Permeability-Reducing (Moisture Vapor Reduction) Admixture:
  - 1. Provide in slabs to receive adhesively applied flooring and moisture sensitive floor finishes.
    - a. Includes, but is not limited to, the following:
      - 1) Resilient sheet.
      - 2) Carpet tile.
      - 3) Other adhesive applied floor finishes.
- D. Other Admixtures: Use admixtures in accordance with manufacturer's written instructions.
  - 1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.
  - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

## 2.12 CONCRETE MIXTURES

- A. Class D: Normal-weight concrete used for interior slabs-on-grade and equipment pads.
  - 1. Exposure Class: ACI 318 F0.
  - 2. Minimum Compressive Strength: 4000 psi at 28 days.
  - 3. Maximum w/cm: 0.50.
  - 4. Minimum Cementitious Materials Content: 520 lb/cu. yd.
  - 5. Air Content: Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

6. Permeability-Reducing (Moisture Vapor Reduction) Admixture: Provide in slabs to receive adhesively applied flooring and moisture sensitive floor finishes.

## **2.13 CONCRETE MIXING**

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94, and furnish batch ticket information.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

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

### **3.02 INSTALLATION OF FORMWORK**

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
  1. For concealed concrete:
    - a. Surface Finish-1.0: ACI 117 Class D, 1 inch.
  2. For exposed concrete, concrete surfaces to receive a rubbed finish, or concrete to be covered with a coating or covering material applied directly to concrete:
    - a. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
  1. Minimize joints.
  2. Exposed Concrete: Symmetrically align joints in forms.

- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
  - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
  - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
  - 1. Provide and secure units to support screed strips
  - 2. Use strike-off templates or compacting-type screeds.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### **3.03 REMOVING AND REUSING FORMS**

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work.
  - 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.

2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
  1. Align and secure joints to avoid offsets.
  2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### **3.04 INSTALLATION OF VAPOR RETARDER**

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643
  1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
  2. Face laps away from exposed direction of concrete pour.
  3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
  4. Lap joints 6 inches and seal with manufacturer's recommended tape.
  5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
  6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
  7. Protect vapor retarder during placement of reinforcement and concrete.
    - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

### **3.05 INSTALLATION OF STEEL REINFORCEMENT**

- A. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- B. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- C. Accurately position, support, and secure reinforcement against displacement.
  1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
  2. Do not tack weld crossing reinforcing bars.
- D. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1- 1/3 times size of large aggregate, whichever is greater.
- E. Provide concrete coverage in accordance with ACI 318.
- F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- G. Splices:

1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.
- H. Install welded-wire reinforcement in longest practicable lengths.
  1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
    - a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.
  2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
  3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
  4. Lace overlaps with wire.

### **3.06 JOINTS**

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Control Joints in Slabs-on-Grade: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
  1. At Contractor's option one or more of the following methods may be used:
    - a. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
    - b. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 9200 "Joint Sealants," are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- D. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
  2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

### **3.07 CONCRETE PLACEMENT**

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
  1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
  1. If a section cannot be placed continuously, provide construction joints as indicated.
  2. Deposit concrete to avoid segregation.
  3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
  4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
    - a. Do not use vibrators to transport concrete inside forms.
    - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.

- c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
  - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
- 1. Do not place concrete floors and slabs in a checkerboard sequence.
  - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 3. Maintain reinforcement in position on chairs during concrete placement.
  - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 5. Level concrete, cut high areas, and fill low areas.
  - 6. Slope surfaces uniformly to drains where required.
  - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
  - 8. Do not further disturb slab surfaces before starting finishing operations.

### **3.08 FINISHING FORMED SURFACES**

- A. As-Cast Surface Finishes:
- 1. At concrete surfaces not exposed to view:
    - a. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
      - 1) Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
      - 2) Remove projections larger than 1 inch.
      - 3) Tie holes do not require patching.
      - 4) Surface Tolerance: ACI 117 Class D.
  - 2. At concrete surfaces exposed to view, concrete surfaces to receive a rubbed finish, concrete to be covered with a coating or covering material applied directly to concrete:
    - a. ACI 301 Surface Finish SF-3.0:
      - 1) Patch voids larger than 3/4 inch wide or 1/2 inch deep.
      - 2) Remove projections larger than 1/8 inch.
      - 3) Patch tie holes.

- 4) Surface Tolerance: ACI 117 Class A.

### **3.09 FINISHING FLOORS AND SLABS**

- A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish:
1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
  2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
  3. Apply float finish to surfaces to receive trowel or broom finish.
- C. Trowel Finish:
1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
  2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
  3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  4. Do not add water to concrete surface.
  5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
  6. Apply a trowel finish to all interior slab surfaces, unless otherwise indicated.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

### **3.10 TOLERANCES**

- A. Conform to ACI 117.

### **3.11 FLOOR FLATNESS AND LEVELNESS TOLERANCES**

- A. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155, within 48 hours after slab installation; report both composite overall values and local values for each measured section.
  - 1. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
  - 2. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.
- B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
  - 1. Exposed to View (without a finish flooring material) and Foot Traffic: F(F) of 25; F(L) of 20, on-grade only.
  - 2. At Carpeting: F(F) of 25; F(L) of 20, on-grade only.
  - 3. At Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
  - 4. At Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
  - 5. At Stained and Polished Concrete Floors: F(F) of 50; F(L) of 30, on-grade only.

### **3.12 CONCRETE CURING**

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
  - 1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
  - 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
  - 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.
- B. Curing Formed Surfaces:
  - 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
  - 2. If forms remain during curing period, moist cure after loosening forms.
  - 3. If removing forms before end of curing period, continue curing for remainder of curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
  - 1. Begin curing immediately after finishing concrete.
    - a. Interior Concrete Floors: Cure for not less than seven days.
- D. Cure concrete according to ACI 308.1, and by one or a combination of the following methods:

1. Moisture Curing:
  - a. a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
  2. b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    - a. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
  3. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
    - a. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

### **3.13 CONCRETE SURFACE REPAIRS**

- A. Defective Concrete:
  1. Repair and patch defective areas when approved by Architect.
  2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
    - a. Limit cut depth to 3/4 inch.
    - b. b. Make edges of cuts perpendicular to concrete surface.
    - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    - d. Fill and compact with patching mortar before bonding agent has dried.
    - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

- a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    - b. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces:
  1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
- E.
  - a. Correct low and high areas.
    - a. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
    2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
    3. After concrete has cured at least 14 days, correct high areas by grinding.
    4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
      - a. Finish repaired areas to blend into adjacent concrete.
    5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
      - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least 3/4-inch clearance all around.
      - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
      - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
      - d. Place, compact, and finish to blend with adjacent finished concrete.
      - e. Cure in same manner as adjacent concrete.
    6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
      - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.

- b. Dampen cleaned concrete surfaces and apply bonding agent.
  - c. Place patching mortar before bonding agent has dried.
  - d. Compact patching mortar and finish to match adjacent concrete.
  - e. Keep patched area continuously moist for at least 72 hours.
- F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- G. Repair materials and installation not specified above may be used, subject to Architect's approval.

### **3.14 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- 1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31.
  - 2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
  - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    - a. Test reports shall include reporting requirements of ASTM C31, ASTM C39, and ACI 301.
- B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172M shall be performed in accordance with the following requirements:
- 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day
  - 2. Slump: ASTM C143:
    - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.

- b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231 pressure method, for normal-weight concrete:
  - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064:
  - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31:
  - a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
  - b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39.
  - a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
  - b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
  - c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressivestrength test value falls below specified compressive strength by more than 10 percent of specified compressive strength.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests:

- a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
  - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Architect.
    - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301, section 1.6.6.3.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness in accordance with ACI 117 and ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.
- E. Water Vapor Permeance Testing:
1. Allow manufacturer of Permeability-Reducing (Moisture Vapor Reduction) Admixture access to concrete work for any concrete sampling and testing required by admixture manufacturer for compliance with warranty requirements.
  2. Refer to Division 09 Finishes sections for water vapor permeance testing required as part of floor finish installations.
  3. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents; at no additional costs to Owner.

### **3.15 PROTECTION**

- A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
  2. Diaper hydraulic equipment used over concrete surfaces.
  3. Prohibit vehicles from interior concrete slabs.
  4. Prohibit use of pipe-cutting machinery over concrete surfaces.
  5. Prohibit placement of steel items on concrete surfaces.
  6. Prohibit use of acids or acidic detergents over concrete surfaces.

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P24010\_002 DTW ADA  
IMPROVEMENTS, ADULT  
CHANGING ROOMS AND BABY  
CHANGING COUNTERS  
Romulus, Michigan

P24010-002

IFB Set

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7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by

**END OF SECTION 033000**



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## **SECTION 055000**

### **METAL FABRICATIONS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Hollow Structural Sections (HSS) countertop and sink support frames, plates, and accessories.

##### **1.02 DEFINITIONS**

- A. Structural Steel: Steel framing and members indicated on Drawings and as described in AISC 303.

##### **1.03 SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of HSS components and connections.
- C. Delegated-Design Submittal: For HSS connections indicated to comply with design loads, include analysis data.
- D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- E. Designer's Qualification Statement.
- F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

##### **1.04 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."
- B. Comply with applicable provisions of the following:
  - 1. AISC 303.
  - 2. AISC 360.

##### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store HSS and packaged materials to prevent corrosion and deterioration; keep off grade with pallets/dunnage; permit inspection and identification.
- B. Store fasteners in sealed, labeled containers; clean and relubricate if required; comply with manufacturer's recommendations for ASTM F1852 assemblies.

## **PART 2 PRODUCTS**

### **2.01 STRUCTURAL-STEEL MATERIALS (HSS)**

- A. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C, structural tubing; sizes and shapes indicated.
- B. Plate and Bar (for connection plates, gussets, baseplates as required for HSS framing): ASTM A36/A36M.
- C. Welding Materials: Per AWS D1.1/D1.1M; compatible with base metals and coatings.
- D. Finish:
  - 1. Interior shop prime, lead- and chromate-free, compatible with field topcoats.
  - 2. Galvanizing only where indicated on Drawings.

### **2.02 FABRICATION**

- A. Shop-fabricate HSS support frames/brackets to dimensions on Drawings; provide cope cuts, end caps where exposed, and continuous fillet welds as indicated.
- B. Provide weld tabs/access holes as needed to weld to existing HSS cross members shown.
- C. Prepare surfaces for welding and coating per manufacturer/AWS.

### **2.03 SHOP CONNECTIONS**

- A. Welded connections per AWS D1.1/D1.1M.
- B. Bolted connections are not anticipated; if used, provide ASTM A307 bolts with ASTM A563 nuts and ASTM F844 washers (snug-tight).

### **2.04 SHOP PRIMING**

- A. Prime steel surfaces except: areas to be field welded and galvanized surfaces.
- B. Surface prep: SSPC-SP 2 or SP 3 as applicable.
- C. Minimum 1.5 mils DFT.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Field-verify existing conditions and locations/elevations of existing HSS to receive new supports.
- B. Do not proceed until unsatisfactory conditions are corrected.

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### **3.02 INSTALLATION**

- A. Set HSS framing accurately to lines and elevations; comply with AISC 303 and AISC 360.
- B. Baseplates/Bearing Plates/Leveling Plates: Clean bearing surfaces; set on wedges/shims/setting nuts; snug-tighten anchor rods after plumbing; pack with grout; finish exposed grout neatly; cure per manufacturer.
- C. Field Weld new HSS supports to existing HSS where indicated; grind smooth where exposed; touch up damaged shop primer after weldi

### **3.03 FIELD CONNECTIONS**

- A. High-Strength Bolts: Install per RCSC; Joint Type: Snug-tightened unless noted otherwise.
- B. Weld Connections: Comply with AWS D1.1/D1.1M; remove backing/runoff tabs where indicated; back-gouge and grind smooth; assemble/weld built-up sections to maintain alignment within AISC 303 tolerances.

### **3.04 FIELD QUALITY CONTROL**

- A. Visual inspection of field welds per AWS D1.1/D1.1M; additional NDE only if required by AHJ/Owner.

**END OF SECTION 055000**



## SECTION 055213

### PIPE AND TUBE RAILINGS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Steel pipe and tube railings.

##### 1.02 COORDINATION

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

##### 1.03 SUBMITTALS

- A. Product Data: For the following:
  - 1. Fasteners.
  - 2. Post-installed anchors.
  - 3. Handrail brackets.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples:
  - 1. Railings and Guardrails: Submit 1 sample 12 inches long for each material and finish selected.
  - 2. Infill: Submit 1 samples 12 inches long or 12 by 12 inches, for each material and finish selected.
  - 3. Miscellaneous: Submit 1 samples, full size, of each elbow, wall bracket and end stop.
- D. Qualification Data: For fabricator.
- E. Qualification Data: For professional engineer.
- F. Welding certificates.
  - 1. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.
- G. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

#### **1.04 QUALITY ASSURANCE**

- A. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- B. Installer Qualifications: Fabricator of products.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

#### **1.06 FIELD CONDITIONS**

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

### **PART 2 PRODUCTS**

#### **2.01 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  - 2. Infill of Guards:
    - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
    - b. Infill load and other loads need not be assumed to act concurrently.
  - 3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
    - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

#### **2.02 METALS, GENERAL**

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

### **2.03 STAINLESS STEEL RAILINGS**

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Pipe: ASTM A312/A312M, Grade TP 304.
- C. Castings: ASTM A743/A743M, Grade CF 8 or CF 20.
- D. Plate and Sheet: ASTM A240/A240M or ASTM A666, Type 304.

### **2.04 FASTENERS**

- A. Fastener Materials:
  - 1. Stainless Steel Railing Components: Type 304 stainless steel fasteners.
  - 2. Finish exposed fasteners to match appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

### **2.05 MISCELLANEOUS MATERIALS**

- A. Handrail Wall Brackets: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
  - 1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt or predrilled hole for exposed bolt anchorage.
  - 2. Provide 1-1/2 inch clearance from inside face of handrail to finished wall surface.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

### **2.06 FABRICATION**

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
  - 1. Rails and Posts: 1-1/2-inch-diameter, unless otherwise indicated
  - 2. Picket Infill: 1/2-inch-round pickets spaced to prohibit the passage of a 4-inch diameter sphere, unless otherwise indicated. Intermediate

3. Rails Infill: 1-1/2-inch-diameter, unless otherwise indicated.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
  1. Clearly mark units for reassembly and coordinated installation.
  2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
  1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
  2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water.
  1. Provide weep holes where water may accumulate.
  2. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove flux immediately.
  4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
- I. Form changes in direction as follows:
  1. By bending or by inserting prefabricated elbow fittings.
    - a. Provide flush (zero-radius) bends where indicated on Drawings.
    - b. Bending shall not result in distortion of railing member.
- J. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

- K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
  - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
  - 2. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

## **2.07 STAINLESS STEEL FINISHES**

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 1. Run grain with long dimension of each piece.
  - 2. When polishing is completed, passivate and rinse surfaces.
  - 3. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Stainless Steel Pipe and Tubing Finishes:
  - 1. 180-Grit Polished Finish: Uniform, directionally textured finish.
- D. Stainless Steel Sheet and Plate Finishes:
  - 1. Directional Satin Finish: ASTM A480, No. 4.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 INSTALLATION, GENERAL**

- A. Perform cutting, drilling, and fitting required for installing railings.
  - 1. Fit exposed connections together to form tight, hairline joints.
  - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
  - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
  - 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 5. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### **3.03 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.

### **3.04 ANCHORING POSTS**

- A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed with 1/8-inch nonshrink, nonmetallic grout buildup, sloped away from post and flush with adjacent surface.

### **3.05 ATTACHING RAILINGS**

- A. Attach handrails to walls with wall brackets.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- B. Secure wall brackets to building construction as follows:
  1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  2. For hollow masonry anchorage, use toggle bolts.
  3. For steel-framed partitions use one of the following:
    - a. Hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
    - b. Fasten brackets directly to steel framing or concealed steel reinforcements, using self-tapping screws of size and type required to support structural loads.
    - c. Use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

### **3.06 CLEANING**

- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

### **3.07 PROTECTION**

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

**END OF SECTION 055213**



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## **SECTION 061000**

### **ROUGH CARPENTRY**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Types of work in this section include the following:
  - 1. Wood framing.
  - 2. Wood blocking.
  - 3. Plywood reinforcement panels within gypsum drywall walls.
- B. Architectural Wood Casework is specified in another Division 06 Section.
- C. Drywall partitions are specified in Division 09 Section Gypsum Board.

##### **1.02 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Wood treatment data, including instructions for handling, storing, installing, and finishing treated materials, and the following:
  - 1. Certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
  - 2. Statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.

#### **PART 2 PRODUCTS**

##### **2.01 MATERIALS**

- A. Lumber Standards: Manufacturer lumber to comply with 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. Grade Stamps: Factory-mark each piece of lumber 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, apply grade stamps to ends or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance from inspection agency in lieu of grade stamp.

- C. Nominal Sizes: Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
1. Provide seasoned lumber with 19 percent moisture content at the time of dressing and shipment, for sizes 2 inches or less in thickness.
- D. Preservative Treated Materials: Comply with applicable requirements of AWPA C2 (lumber), except that lumber not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX) and AWPA C9 v
1. Preservative Chemicals shall contain no arsenic or chromium.
  2. Treat indicated items and the following:
    - a. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
    - b. Wood framing members less than 18 inches (460 mm) above grade.
    - c. Wood floor plates installed over concrete slabs directly in contact with earth.
  3. Approved Manufacturers: Provide treatment chemicals produced by one of the following:
    - a. Arch Wood Protection, Inc.
    - b. Baxter: J. H. Baxter Co.
    - c. Chemical Specialties, Inc.
    - d. Hickson Corp.
    - e. Hoover Treated Wood Products, Inc.
    - f. Osmose Wood Preserving, Inc.
  4. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
  5. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- E. Fire Resistant Treated Lumber and Plywood: Where indicated, provide "Osmose" "Flame Proof LHC" or equal.
1. Provide fire resistant lumber in each application, unless otherwise indicated.
- F. Dimension Lumber: Provide lumber of the following product classification and species indicated:
1. Concealed Boards: Standard grade, any species graded under WWPA rules or No. 3 grade Southern Pine graded under SPIB rules.

2. Lumber for Miscellaneous Uses: Standard grade lumber for support of other work, including bucks, nailers, blocking, furring, stripping and similar members.
- G. Plywood:
1. Provide APA grade B-C plywood for use in concealed locations.
  2. Plywood Backing Panels: Where indicated for mounting electrical or communications equipment, provide fire-retardant treated APA C-D PLUGGED INT panels, minimum 23/32" thick.
  3. Plywood Reinforcing Panels: For concealed installation within drywall partitions, provide fire-retardant treated panels with grade designation APA STRUC I rated sheathing. Provide units of thickness shown, or if not shown, of thickness matching drywall.
- H. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.
1. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide connectors, fasteners and anchorages with G185 hot-dip zinc coating (ASTM A 153 for fasteners and ASTM A123 for individual connectors) or Type 304 or Type 316 stainless steel.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- D. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.
- E. Install rough carpentry work to comply with recommendations of mfr of product involved for use intended. Set carpentry work to required levels and lines, with members plumb and true and cut to fit.

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- F. Securely attach carpentry work. Install fasteners without splitting wood: fasten panel products to allow for expansion at joints unless otherwise indicated.
  - 1. Countersink nail heads on exposed carpentry work and fill holes.
- G. Install plywood backing panels for telephone equipment to substrate as indicated, or if not indicated, with 3/8-inch diameter expansion bolts or toggle bolts spaced 18-inches on center around panel perimeters and on 24-inch centers within panels.

**END OF SECTION 061000**

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## **SECTION 064100**

### **ARCHITECTURAL WOOD CASEWORK**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Wood-based components.
- B. Laminate materials.
- C. Accessories and Hardware.
- D. Cabinets.
- E. Fabrication.
- F. Countertops.- Specified In 12 3600 Countertops

##### **1.02 RELATED REQUIREMENTS**

- A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 123600 - Countertops.

##### **1.03 REFERENCE STANDARDS**

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- E. BHMA A156.9 - Cabinet Hardware; 2020.
- F. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.
- G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- H. UL (DIR) - Online Certifications Directory; Current Edition.

##### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination/Verification: Field-verify existing finishes designated to be matched prior to fabrication. Report any discontinued or unobtainable finishes and propose the nearest available match with samples for review.
- B. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

### **1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data:
  - 1. Anchors and fasteners.
  - 2. Adhesives.
  - 3. Wood preservative treatment.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories. Include the following:
  - 1. Information required by AWI/AWMAC/WI (AWS).
  - 2. Dimensioned plans, elevations, and sections.
  - 3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.
  - 4. Show locations and sizes of cutouts and holes for items installed in architectural woodwork.
- D. Samples: Three samples of each of the following:
  - 1. Plastic Laminates, metal cladding: 12 by 12 inches, for each type, color, pattern, and surface finish.
  - 2. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

### **1.06 QUALITY ASSURANCE**

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
  - 1. Single Source Responsibility: Provide and install this work from single fabricator.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with AWI/AWMAC/WI (AWS).
- B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.
- C. Store woodwork in installation areas or in areas with the same environmental conditions; temperature and humidity conditions in storage areas shall be at the same levels planned for occupancy.
- D. Protect units from moisture damage.

## 1.08 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

## PART 2 PRODUCTS

### 2.01 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Particle Board: ANSI A208.1, Grade M-2.
- C. Medium Density Fiberboard (MDF): ANSI A208.2, Grade 130.
- D. Hardwood Plywood: HPVA HP-1.
- E. Softwood Plywood: PS 1.
- F. Hardboard: AHA A135.4.
- G. Fire Retardant Treatment:
  - 1. Manufacturers:
    - a. Lonza Group: [www.wolmanizedwood.com](http://www.wolmanizedwood.com).
    - b. Hoover Treated Wood Products, Inc: [www.frtw.com](http://www.frtw.com).
    - c. Koppers, Inc: [www.koppersperformancechemicals.com](http://www.koppersperformancechemicals.com).
    - d. Viance, LLC: [www.treatedwood.com](http://www.treatedwood.com).
    - e. Koskisen; KoskiDecor F: [www.koskisen.fi/en/](http://www.koskisen.fi/en/)
    - f. Substitutions: See Section 01 6000 - Product Requirements.
  - 2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
    - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood
- H. Preservative Treatment:
  - 1. Manufacturers:
    - a. Lonza Group: [www.wolmanizedwood.com](http://www.wolmanizedwood.com).
    - b. Hoover Treated Wood Products, Inc: [www.frtw.com](http://www.frtw.com).
    - c. Koppers Performance Chemicals, Inc: [www.koppersperformancechemicals.com](http://www.koppersperformancechemicals.com).

- d. Viance, LLC: [www.treatedwood.com](http://www.treatedwood.com).
- e. Substitutions: See Section 01 6000 - Product Requirements.
- 2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
  - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
  - b. Treat lumber in contact with masonry or concrete.
  - c. Treat lumber in other locations as indicated.
- 3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
  - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
  - b. Treat plywood in contact with masonry or concrete.
  - c. Treat plywood at countertop subtops at sinks or other wet locations.
  - d. Treat plywood in other locations as indicated.
- 4. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative
- 5. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

## 2.02 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as indicated or recommended for specific applications.
  - 1. Manufacturers: Subject to compliance with requirements, provide products as indicated in Color Codes on Drawings.
  - 2. Colors, Patterns, and Finishes: As indicated in Color Codes on Drawings. Where matching existing is indicated, provide an exact match to existing color, pattern, finish, and sheen. Verify in field. If the exact product is unavailable or discontinued, submit the closest available match for review, considering color, pattern scale, gloss level, and texture.
- B. Edgebanding: Rigid PVC extrusions, flat shaped, smooth texture, through color with satin finish. Width to match component thickness. Match adjacent laminate and, where indicated, match existing color, pattern, and finish.
  - 1. 0.118 inch (3 mm) thick at doors, drawer fronts and countertops.

2. 0.039 inch (1 mm) thick elsewhere, including exposed exterior cabinet members, top edges of drawer boxes, adjustable shelves and interior panels.

### **2.03 METAL CLADDING MATERIALS**

- A. Stainless Steel Sheet Cladding: ASTM A240/A240M, Type 304; 18 ga (0.048 in) typical, 16 ga at corners/edge guards or high-abuse areas.
  1. Match Existing Standard: Unless otherwise indicated, provide stainless-steel cladding that matches existing adjacent work in appearance and performance, including finish, sheen, grain character/orientation, panel module, reveals, and edge conditions. Verify in field prior to fabrication.
  2. Application: Cabinet and counter face cladding, trims, and exposed vertical/horizontal surfaces as indicated.
  3. Substrate/Backing: As recommended by fabricator to support stainless steel cladding, maintain flatness, and allow secure anchorage.
  4. Accessories: Provide stainless steel fasteners, clips, trims, and edge returns as required for a complete installation.
  5. Fabrication: Form stainless steel sheet with tight, accurate bends; weld corners smooth and grind flush; polish exposed welds to match adjacent finish. Provide full returns at edges and corners to match existing details.

### **2.04 ACCESSORIES**

- A. Support Framing, Grounds, and Concealed Blocking: Refer to Section 06 1000 - Rough Carpentry.
- B. Stain and Finishing Materials: In compliance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- C. Adhesives: Type recommended by fabricator to suit application.
  1. Do not use adhesives that contain urea formaldehyde.
  2. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Wood Glues: 30 g/L.
    - b. Contact Adhesive: 250 g/L.
- D. Fasteners: Size and type to suit application.

- E. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- F. Concealed Joint Fasteners: Threaded steel.

## **2.05 TRIM AND EDGE ACCESSORIES**

- A. General Matching Requirement: Unless otherwise indicated, provide trims that match existing adjacent millwork trims in profile, material alloy/temper, gauge, finish, sheen, and jointing. Field-verify prior to fabrication. If an exact match is unavailable, submit the closest available match with samples for review.
- B. Millwork Outside Corner Trim:
  - 1. Application: Install at exposed millwork outside corners as indicated on the drawing to provide crisp, durable finish and alignment, matching existing profile and finish where adjacent work occurs.
  - 2. Basis-of-Design Product: Fry Reglet Millwork Arrow Outside Corner, or approved equal capable of matching existing profile.
  - 3. Material: Extruded aluminum, alloy/temper to match existing.
  - 4. Finish: Match existing.
- C. Millwork Return Key Trim:
  - 1. Application: Terminate millwork edge returns, , matching existing profile and reveal.
  - 2. Basis-of-Design Product: Fry Reglet Millwork Insert Return Key, or approved equal capable of matching existing profile.
  - 3. Material: Extruded aluminum, alloy/temper to match existing.
  - 4. Finish: Match existing.

## **2.06 HARDWARE**

- A. Cabinet Hardware, General: BHMA A156.9, types as indicated for quality grade specified.
  - 1. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated. Unless otherwise indicated, provide the following finish:
    - a. Satin Chrome: BHMA 626.
  - 2. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

- B. Drawer Slides: BHMA A156.9, B05091; side mounted; zinc-plated steel ball-bearing slides; and as follows:
1. Box/Bin Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide; 100 lbf.
    - a. Basis-of-Design Products: Accuride 7434 (overtravel); or comparable products of Häfele, Hettich, or Knape & Vogt.
  2. File Drawer Slides: Grade 1HD-200; for drawers not more than 6 inches high or 24 inches wide; 200 lbf.
    - a. Basis-of-Design Products: Accuride 3640 Series (1-inch overtravel), or comparable products of Häfele, Hettich, or Knape & Vogt.
  3. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches wide and 24 inches wide; 50 lbf.
    - a. Basis-of-Design Products: Accuride 2009 Series; or comparable products of Häfele, Hettich, or Knape & Vogt.
  4. Keyboard Slide: Grade 1HD-100; 100lbf.
    - a. Basis-of-Design Products: Accuride 2009 Series; or comparable products of Häfele, Hettich, or Knape & Vogt.
  5. Trash Bin Slides: Grade 1HD-200; 200 lbf; for trash bins not more than 20 inches high and 16 inches wide.
    - a. Basis-of-Design Product: Accuride 3640 Series (1-inch overtravel); or comparable products of Häfele, Hettich, or Knape & Vogt.
- C. Back-Mounted Pulls:
1. Back mounted, 5 inches long, by 3/8 inches in diameter by 1-1/2 inches deep.
    - a. Basis-of-Design Product: Rockwood Manufacturing Co.; RM 710-Series; or comparable models of SIRO or an approved substitute.
- D. Door and Drawer Silencers: BHMA A156.16, L03011.
- E. Grommets for Cable Passage: 2-1/2 inch OD, solid brass grommets and matching caps with slot for wire passage.
1. Color: Satin Chrome.
  2. Available Product:
    - a. Doug Mockett & Company Inc.; MM6 Series: [www.mockett.com](http://www.mockett.com).
- F. Millwork Countertop Power Units.

1. Corded In Surface Power Unit
  2. Configuration: Retractable, one touch door.
  3. Color: Clear anodized aluminum.
  4. Available Product:
    - a. Byrne, Mho: [www.byrne.com](http://www.byrne.com).
- G. Countertop Support Brackets
1. Tee-Shaped Brackets: Fabricated from 6063-T6 extruded aluminum 2 inch by 3 inch by 3/16 inch Tee.
    - a. Finish: Clear Anodized.
    - b. Size: 18 inch support unless otherwise indicated.
      - 1) Manufacturers:
        - (a) Rakks Model EH 1818 ; Rangine Corp.: [www.rakks.com](http://www.rakks.com).
        - (b) Or equal by A&M Hardware, Inc.; [www.aandmhardware.com](http://www.aandmhardware.com).
        - (c) Substitutions: See Section 01 6000 - Product Requirements.
      - c. Where concealed flush mount is indicated on Drawings, provide the following:
        - 1) Manufacturers:
          - (a) Rakks Model EH1818-FM; Rangine Corp.: [www.rakks.com](http://www.rakks.com).
          - (b) Or equal by A&M Hardware, Inc.; [www.aandmhardware.com](http://www.aandmhardware.com).
          - (c) Substitutions: See Section 01 6000 - Product Requirements.
- H. Z-Clips: 6063-T6 extruded aluminum z clips. Sized as required to support applied loads.
1. Manufacturers:
    - a. Monarch Metal Fabrication: [www.monarchmetal.com](http://www.monarchmetal.com).
    - b. Eagle Mouldings Inc.: [www.eagle-aluminum.com](http://www.eagle-aluminum.com).
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- I. Aluminum Channels and Angles: 6061-T6 extruded aluminum channels, with sharp corners, mill finish, size as required or indicated on Drawings.

## 2.07 CABINETS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Casework Construction Type: Type A - Frameless.
- C. Door and Drawer Style: Style 1 - Overlay ; flush overlay.

- D. High-pressure decorative laminate (HPDL) on exposed Cabinet Body Surfaces:
1. Finish: High-pressure decorative laminate (HPDL) as indicated on drawings.
  2. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
  3. Color/Pattern Consistency: All panels from the same dye lot; provide best achievable visual consistency across adjacent faces.
  4. Grain and Pattern Direction to run vertically where applicable. Reference drawings.
  5. Edge: Provide 2mm PVC edge banding, color to match face laminate unless otherwise indicated.
- E. Thermally Fused Melamine (TFM) on exposed Cabinet Body Surfaces:
1. Finish: Thermally fused melamine (TFM) as indicated on drawings.
  2. Thermally Fused Melamine: Decorative melamine-impregnated paper thermally fused to particleboard or MDF core in accordance with ANSI A208.1 (particleboard) or ANSI A208.2 (MDF).
  3. Color/Pattern Consistency: Use panels from the same manufacturer and production lot where feasible to ensure uniform color and finish.
  4. Grain and Pattern Direction: Vertical where applicable. Reference drawings.
  5. Edge: Provide PVC edge banding on visible interior edges; color to match face unless otherwise indicated.
- F. Exposed Door and Drawer Fronts
1. Finish: High-pressure decorative laminate (HPDL) as indicated on drawings.
  2. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
  3. Vertical Surfaces: Grade VGS (0.028 inch thick).
  4. Grain and Pattern Direction to run vertically where applicable. Reference drawings.
  5. Edge: Provide 2mm PVC edge banding, color to match face laminate unless otherwise indicated.
- G. Semi-exposed Surfaces:
1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surface.
  2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, same species indicated for exposed surfaces.

3. Drawer Bottoms: Hardwood veneer plywood.
- H. Concealed Surfaces:
  1. Manufacturer's choice.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
  1. Drawer Construction Method: Multiple dovetailed.
- J. Cabinet and millwork sizes, layouts, and configurations: As indicated on Drawings.

## **2.08 FABRICATION**

- A. General:
  1. Fabricate woodwork to dimensions, profiles, and details indicated.
  2. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation.
  3. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal cut edges
    - a. Locate openings accurately and use templates to produce accurately sized and shaped openings.
  4. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting
  5. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
    - a. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
    - b. Cap exposed plastic laminate finish edges with material of same finish and pattern, unless otherwise indicated.
  6. Cabinets and Millwork:
    - a. Assembly: Shop assemble cabinets and millwork for delivery to site in units easily handled and to permit passage through building openings.
    - b. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

### **3.02 PREPARATION**

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that architectural woodwork can be supported and installed as indicated.
- B. Condition all interior architectural woodwork to temperature and humidity conditions in installation areas for not less than 72 hours prior to installation.
  - 1. Temperature and humidity conditions shall be same levels planned for occupancy.

### **3.03 INSTALLATION**

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Install architectural woodwork level, plumb, true in line, and without distortion.
  - 1. Shim as required with concealed shims.
  - 2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts

### **3.04 CABINET AND MILLWORK INSTALLATION**

- A. Set and secure custom cabinets and millwork in place, assuring that they are rigid, plumb, and level.
- B. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned.
  - 1. Adjust hardware to center doors and drawers in openings and to provide easy and smooth operation.
- C. Use fixture attachments in concealed locations for wall mounted components.
  - 1. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips, or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

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D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

### **3.05 ADJUSTING**

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

### **3.06 REPAIRING AND CLEANING**

A. Repair damaged and defective architectural woodwork, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural woodwork.

B. Clean all architectural woodwork, including, but not limited to, casework, counters, shelves, hardware, fittings, and fixtures.

**END OF SECTION 064100**

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## **SECTION 081113**

### **HOLLOW METAL DOORS AND FRAMES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Accessories.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 081433 - Stile and Rail Wood Doors
- B. Section 087100 - Door Hardware.
- C. Section 099100 - Painting

##### **1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2024.
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.
- F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- G. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2023b.
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- I. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2024.

- J. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- K. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- L. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- N. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- O. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- P. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- Q. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.
- R. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.
- S. NAAMM HMMA 850 - Fire-Rated Hollow Metal Doors and Frames; 2014.
- T. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; 2018.
- U. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- V. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

#### **1.04 SUBMITTALS**

- A. See Section 013300 - Submittal Procedures for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
  - 1. Door Schedule: Provide schedule coordinated with numbering on drawings and hardware schedule. Indicate door types and openings receiving electrified hardware.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.

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G. Installer's Qualification Statement.

#### **1.05 ADMINISTRATIVE REQUIREMENTS**

A. Coordination:

1. Coordinate with wall construction for anchor placement.
2. Coordinate installation of hardware.
3. Coordinate installation of glazing.

#### **1.06 REGULATORY REQUIREMENTS**

- A. Conform to applicable Building Code for fire rated assemblies.
- B. Accessibility: Conform to ADA and applicable building codes.

#### **1.07 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

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

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

A. Hollow Metal Doors and Frames:

1. Amweld Building Products, Inc.
2. Ceco Door, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
3. Curries, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
4. Fleming Door Products, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
5. Republic Doors, an Allegion brand: [www.republicdoor.com/#sle](http://www.republicdoor.com/#sle).
6. Steelcraft, an Allegion brand: [www.allegion.com/#sle](http://www.allegion.com/#sle).
7. Pioneer Builders. Products Corp./Div. CORE Industries, Inc.

## 2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
  2. Accessibility: Comply with ICC A117.1 and ADA Standards.
  3. Door Edge Profile: Manufacturers standard for application indicated.
  4. Typical Door Face Sheets: Flush.
  5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
  6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
    - a. Prepare doors and frames for hardware in accordance with templates provided under 087100 - Door Hardware
  7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvanized) for corrosive locations.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

## 2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire-Rated, Knock-Down Type:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
  - a. Level 2 - Heavy-duty.
  - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
  - c. Model 2 - Seamless.
  - d. Door Face Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

#### **2.04 HOLLOW METAL FRAMES**

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Interior Door Frames, Non-Fire Rated: Knock-down type.
  1. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum for doors up to 42 inches wide.
  2. Frame Metal Thickness: 14 gauge, 0.067 inch (1.7 mm), minimum for doors greater than 42 inches wide.
  3. Frame Metal Thickness: 14 gauge, 0.067 inch (1.7 mm), minimum for doors with continuous hinges, regardless of width
  4. Frame Finish: Factory primed and field finished.

#### **2.05 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

#### **2.06 ACCESSORIES**

- A. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- B. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
- C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

### **3.02 INSTALLATION**

- A. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames with spreaders, accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
  - 1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
  - 2. In steel-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels; attach wall anchors to studs with screws.
  - 3. In in-place gypsum board partitions, install knock-down, slip-on, drywall frames.
- B. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.
- C. Fitting Clearances for Non-Rated Doors: Provide 1/8-inch at jambs and heads; 1/16-inch per leaf at meeting stiles for pairs of doors; and 1/2-inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/8-inch clearance from bottom of door to top of threshold.
- D. Install door hardware as specified in Section 087100.
  - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- E. Coordinate installation of electrical connections to electrical hardware items.

### **3.03 ADJUSTING**

- A. Adjust for smooth and balanced door movement.
- B. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

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- C. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

### **3.04 SCHEDULE**

- A. Refer to Door and Frame Schedule on the drawings.

**END OF SECTION 081113**



## **SECTION 081433**

### **STILE AND RAIL WOOD DOORS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Interior stile and rail wood doors.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 081113 - Hollow Metal Doors and Frames.

##### **1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:
  - 1. Door schedule indicating door location, type, size, fire protection rating, and swing.
  - 2. Door elevations, dimensions and location of hardware, lite locations, and glazing thickness.
  - 3. Dimensions and locations of mortises and holes for hardware.
  - 4. Clearances and undercuts.
- D. Samples for Initial Selection: For factory-finished doors.
- E. Samples for Verification:
  - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Warranty, executed in Owner's name.

##### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than five years of documented experience.

- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than five years of documented experience.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Package, deliver, and store doors in accordance with quality standard specified.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

### **1.06 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Delamination of veneer.
    - b. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
    - c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
  2. Warranty must also include installation and finishing that may be required due to repair or replacement of defective doors.
  3. Warranty must be in effect during specified period of time from date of Substantial Completion.
  4. Warranty Period for Interior Doors: Five years.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Source Limitations: Obtain stile and rail wood doors from single manufacturer.

### **2.02 MATERIALS**

- A. Use only materials that comply with referenced standards and other requirements specified.
1. Assemble exterior doors, including components, with wet-use adhesives complying with ASTM D5572 for finger joints and with ASTM D5751 for joints other than finger joints.

2. Assemble interior doors, including components, with either dry-use or wet-use adhesives complying with ASTM D5572 for finger joints and with ASTM D5751 for joints other than finger joints
- B. Panel Products: Any of the following unless otherwise indicated:
  1. Particleboard: ANSI A208.1, Grade M-2.
  2. Medium-density fiberboard (MDF,) complying with ANSI A208.2, Grade 130.
  3. Veneer-core plywood.

### **2.03 INTERIOR STILE AND RAIL WOOD DOORS**

- A. Interior Stile and Rail Wood Doors: Interior doors complying with AWI, AWMAC, and WI's Architectural Woodwork Standards and with other requirements specified.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
    - a. Eggers Industries, acquired by VT Industries, Inc. : [www.eggersindustries.com](http://www.eggersindustries.com).
    - b. Graham Wood Doors; Masonite Architectural: [www.graham-maiman.masonite.com](http://www.graham-maiman.masonite.com).
    - c. Masonite Architectural: <https://architectural.masonite.com>.
    - d. Oshkosh Door Company: [www.oshkoshdoor.com](http://www.oshkoshdoor.com).
    - e. VT Industries, Inc: [www.vtindustries.com](http://www.vtindustries.com).
  2. Architectural Woodwork Standards Grade: Custom.
  3. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
  4. Panel Designs: match existing louvered infill panel.
  5. Finish: Transparent, match existing.
  6. Wood Species and Cut for Transparent Finish: Douglas fir or western hemlock, quarter sawed/sliced (vertical grain), to match existing adjacent doors.
  7. Door Construction for Transparent Finish:
    - a. Stile and Rail Construction:
      - 1) Clear lumber; may be edge glued for width. Select lumber for similarity of grain and color, and arrange for optimum match between adjacent pieces.
      - 2) Veneered, structural composite lumber. Select veneers for similarity of grain and color, and arrange for optimum match between adjacent pieces.
  8. Stile and Rail Widths: Match existing doors, but not less than the following:
    - a. Stiles, Top and Intermediate Rails: 4-1/2 inches (114 mm).

- b. Bottom Rails: 9 inches (229 mm).

#### **2.04 STILE AND RAIL WOOD DOOR FABRICATION**

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:
  - 1. Clearances:
    - a. Provide 1/8 inch (3 mm) at heads, jambs, and between pairs of doors.
    - b. Provide 1/2 inch (13 mm) from bottom of door to top of decorative floor finish or covering.
    - c. Where threshold is shown on Drawings or scheduled, provide not more than 3/8 inch (10 mm) from bottom of door to top of threshold.
  - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- B. Fabricate stile and rail wood doors in sizes indicated for field fitting.
- C. Factory machine doors for hardware that is not surface applied.
  - 1. Locate hardware to match existing adjacent doors.
  - 2. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
  - 3. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

#### **2.05 FACTORY FINISHING**

- A. Comply with referenced quality standard for factory finishing.
  - 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 2. Finish faces, all four edges, edges of cutouts, and mortises.
  - 3. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors; match existing adjacent doors.
- C. Transparent Finish:
  - 1. Architectural Woodwork Standards Grade: Premium.
  - 2. Staining: As selected by Architect from manufacturer's full range, to match existing adjacent doors.
  - 3. Sheen: Satin.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
  - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION**

- A. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- B. Job-Fitted Doors:
  - 1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
    - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
  - 2. Machine doors for hardware.
  - 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - 4. Clearances:
    - a. Provide 1/8 inch (3 mm) at heads, jambs, and between pairs of doors.
    - b. Provide 1/2 inch (13 mm) from bottom of door to top of decorative floor finish or covering.
    - c. Where threshold is shown on Drawings or scheduled, provide not more than 3/8 inch (10 mm) from bottom of door to top of threshold.
  - 5. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory- Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### **3.03 ADJUSTING**

- A. Operation: Rehang or replace doors that do not swing or operate freely.

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- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of

**END OF SECTION 081433**

## **SECTION 083400**

### **CHAIN LINK GATES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES:**

- A. Swing gates.

##### **1.02 SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Fence and gate posts, rails, and fittings.
    - b. Chain-link fabric, reinforcements, and attachments.
    - c. Gates and hardware.
- B. Shop Drawings: For each type of fence and gate assembly.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Include accessories, hardware, gate operation, and operational clearances.

##### **1.03 FIELD CONDITIONS**

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

#### **PART 2 - PRODUCTS**

##### **2.01 CHAIN-LINK FENCE FABRIC**

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
  - 1. Fabric Height: 48 inches (1219.2 mm).
  - 2. Aluminum Wire Fabric: ASTM F1183, with mill finish, and wire diameter of 0.192 inch (4.88 mm).
    - a. Mesh Size: 2 inches (50.8 mm)

## 2.02 SWING GATES

- A. General: ASTM F900 for gate posts and single swing gate types.
  - 1. Gate Leaf Width: 36 inches (914.4 mm).
  - 2. Framework Member Sizes and Strength: Based on gate fabric height of 48 inches (1219.2 mm).
- B. Pipe and Tubing:
  - 1. Aluminum: ASTM B429/B429M; mill finish.
  - 2. Gate Posts: Rectangular tubular aluminum.
  - 3. Gate Frames and Bracing: Rectangular tubular aluminum.
- C. Frame Corner Construction: assembled with corner fittings.
- D. Hardware:
  - 1. Hinges: 180-degree outward swing.
  - 2. Latch: ADA compliant latch, permitting operation from both sides of gate.
  - 3. Closer: Manufacturer's standard, ADA compliant closer.

## 2.03 FITTINGS

- A. Provide fittings according to ASTM F626.
- B. Post Caps: Provide for each post.
- C. Rail and Brace Ends: For each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
  - 1. Top Rail Sleeves: Aluminum Alloy 6063 not less than 6 inches (152.4 mm) long.
- E. Tension Bars: Aluminum, length not less than 2 inches (50.8 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- F. Tie Wires, Clips, and Fasteners: According to ASTM F626.
  - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
    - a. Aluminum: ASTM B211 (ASTM B211M); Alloy 1350-H19; 0.148-inch- (3.76-mm-) 1) diameter, mill-finished wire.
- G. Finish:
  - 1. Aluminum: Mill finish.

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## **2.04 GROUT AND ANCHORING CEMENT**

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for pavement work, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 GATE INSTALLATION**

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

### **3.03 ADJUSTING**

- 1. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

**END OF SECTION 083400**



**SECTION 087100**

**DOOR HARDWARE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES:**

- A. Hinges.
- B. Mortise locks.
- C. Operating trim.
- D. Surface closers.
- E. Thresholds.
- F. Metal protective trim units.

**1.02 COORDINATION**

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field-verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

**1.03 SUBMITTALS**

- A. Product Data Submittals: For each product.
- B. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
- C. Samples for Verification: For each type of exposed product, in each finish specified.
- D. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
- E. Maintenance Data: For each type of door hardware to include in maintenance manuals.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Inventory door hardware on receipt and provide secure lockup for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

#### **1.05 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures, including excessive deflection, cracking, or breakage.
    - b. Faulty operation of doors and door hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
  - 2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
    - a. Manual Closers: 10 years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### **2.01 SOURCE LIMITATIONS**

- A. Obtain each type of door hardware from single manufacturer.

#### **2.02 PERFORMANCE REQUIREMENTS**

- A. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the USDOJ's "2010 ADA Standards for Accessible Design".
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
  - 2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (12.7 mm) high.
4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

### **2.03 HINGES**

- A. Hinges: ANSI/BHMA A156.1.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allegion plc.
    - b. Hager Companies.
    - c. McKinney Products Company; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY.
    - d. STANLEY; dormakaba USA, Inc.

### **2.04 MECHANICAL LOCKS AND LATCHES**

- A. Lock Functions: Match existing adjacent doors of similar function.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
  1. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
- C. Lock Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
- D. Lock Trim:
  1. Description: Existing Bath privacy mortise lockset with new ADA-compliant thumb turn. Replace the thumb turn only.
  2. Basis-of-Design: Schlage ADA turn 09-509 x L583-363, or approved equal.
  3. New louvered stile and rail wood doors to receive a new Schlage Bath Privacy L-Series lockset with a new ADA-compliant thumb turn. Match existing lever style and finish.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
- F. Mortise Locks: ANSI/BHMA A156.13, Operational Grade 1 stamped steel case with steel or brass parts; Series 1000.
  1. Match hardware, lever style and finish of existing adjacent doors.
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allegion plc.
    - b. Hager Companies.
    - c. STANLEY; dormakaba USA, Inc.
    - d. Yale Security Inc; ASSA ABLOY.

## **2.05 OPERATING TRIM**

- A. Operating Trim: ANSI/BHMA A156.6; stainless steel unless otherwise indicated.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allegion plc.
    - b. Don-Jo Mfg., Inc.
    - c. Hager Companies.

## **2.06 SURFACE CLOSERS**

- A. Surface Closers: ANSI/BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
  1. Basis-of-Design: Falcon SC61A RW/PA, or approved equivalent.
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allegion plc.
    - b. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
    - c. SARGENT Manufacturing Company; ASSA ABLOY.
    - d. STANLEY; dormakaba USA, Inc.

- e. Yale Security Inc; ASSA ABLOY.

## 2.07 THRESHOLDS

- A. Thresholds: ANSI/BHMA A156.21; fabricated to full width of opening indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hager Companies.
    - b. National Guard Products, Inc.
    - c. Zero International; Allegion plc.
  - 2. Basis-of-Design Product: Zero International Thresholds 235, ramp from 0, or approved equal.

## 2.08 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: ANSI/BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allegion plc.
    - b. Don-Jo Mfg., Inc.
    - c. Hager Companies.
    - d. Rockwood Manufacturing Company; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY.
    - e. inpro Corporation.

## 2.09 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and ANSI/BHMA A156.18.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended; however, aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

## **2.10 FINISHES**

- A. Provide finishes complying with ANSI/BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Steel Frames: For surface-applied door hardware, drill and tap doors and frames in accordance with ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

### **3.03 INSTALLATION**

- A. Mounting Heights: Mount door hardware units at heights to match existing adjacent doors, unless otherwise indicated or required to comply with governing regulations.
  1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (762 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

### **3.04 ADJUSTING**

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

### **3.05 CLEANING AND PROTECTION**

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

**END OF SECTION 087100**



## **SECTION 088000**

### **GLAZING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Monolithic glazing.
- B. Fire rated glazing.
- C. Glazing compounds.

##### **1.02 REFERENCE STANDARDS**

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- D. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.
- I. GANA (GM) - GANA Glazing Manual; 2022.
- J. GANA (SM) - GANA Sealant Manual; 2008.
- K. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. IGMA TB-3001 - Guidelines for Sloped Glazing; 2001.
- M. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).
- N. NGA (LGRM) - Laminated Glazing Reference Manual; 2019.

##### **1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.

- B. Product Data on \_\_\_\_\_ Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Certificate: Certify that products of this section meet or exceed specified requirements.

#### **1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with GANA (GM), GANA (SM), IGMA TM-3000, NGA (LGRM), and IGMA TB-3001 for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.

#### **1.05 FIELD CONDITIONS**

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Float Glass Manufacturers:
  - 1. Cardinal Glass Industries: [www.cardinalcorp.com/#sle](http://www.cardinalcorp.com/#sle).
  - 2. Guardian Glass, LLC: [www.guardianglass.com/#sle](http://www.guardianglass.com/#sle).
  - 3. Pilkington North America Inc: [www.pilkington.com/na/#sle](http://www.pilkington.com/na/#sle).
  - 4. Saint Gobain North America: [www.saint-gobain.com/#sle](http://www.saint-gobain.com/#sle).
  - 5. Vitro Architectural Glass (formerly PPG Glass): [www.vitroglazings.com/#sle](http://www.vitroglazings.com/#sle).
  - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Fire Rated Glass Manufacturers:
  - 1. SAFTIFIRST, a division of O'Keeffe's Inc.; [www.safti.com](http://www.safti.com).
  - 2. Schott Corporation: [www.us.schott.com](http://www.us.schott.com).
  - 3. Technical Glass Products (TGP); [www.fireglass.com](http://www.fireglass.com).

4. Vetrotech Saint-Gobain North America; [www.vetrotech.com](http://www.vetrotech.com).
5. Substitutions: Refer to Section 01 6000 - Product Requirements.

## **2.02 PERFORMANCE REQUIREMENTS**

- A. Probability of Breakage: Design glass for a probability of breakage not greater than 0.008 (8 lites per 1000) for glass not more than 15 degrees from vertical.
- B. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Insulating Glass:
  1. Insulating Glass Certification Program: Provide insulating glass units that are certified by the Insulating Glass Certification Council (IGCC).
    - a. Provide permanent markings with appropriate certification label of IGCC on either the spacer or one lite of each insulated unit.
- D. Safety Glazing:
  1. Complies with ANSI Z97.1 and 16 CFR 1201; test requirements for Class A/Category II.
  2. Markings for Safety Rated Glazing: Provide permanent markings on safety-rated glazing in compliance with applicable safety glazing standards, ICC (IBC), local building code, and authorities having jurisdiction.
- E. Fire Rated Glazing:
  1. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire protection ratings indicated; tested in accordance with NFPA 80, NFPA 252, NFPA 257, UL 9, UL 10B, and UL 10C.
    - a. Fire protection rated glazing with a 20 minute rating shall be exempt from the hosestream test.
  2. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire protection ratings indicated; tested in accordance with ASTM E119, NFPA 80, NFPA 251, NFPA 252, NFPA 257, UL 9, UL 10B, UL 10C, and UL 263.
  3. Labeling: Provide permanent markings on fire rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
    - a. "W" Label: Meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.

- b. "OH" Label: Meets fire window assembly criteria including hose stream test of NFPA 257 or UL 9 fire test standards.
  - c. "D" Label: Meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
  - d. "H" Label: Meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
  - e. "T" Label: Meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
  - f. "XXX" Label - Placeholder that represents fire protection or fire resistance rating period, in minutes.
4. Accessories:
- a. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with fire rated glazing and each other, and that are approved for use with fire rated glazing by testing agencies that listed and labeled fire rated glazing.
- F. Glass Thickness: Indicated glass thicknesses are minimums. Provide glass that complies with performance requirements and load designs, and is not less than the thickness indicated.
- G. Glass Strength:
- 1. Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with performance requirements.
  - 2. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with performance requirements.
- H. Glass Distortion Tolerances:
- 1. Roller Wave: Maximum 0.003 (0.076 mm) from peak to valley within the main body of the sheet and maximum 0.008 (0.2 mm) within 10.5 inches of a leading or trailing edge.
  - 2. Localized Warp: Maximum 0.03 inch (0.8 mm) over any 12 inch (305 mm) span, but limited to 0.31 inch (8 mm).

### **2.03 FLOAT GLASS**

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.

- B. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
  - 1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
  - 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

#### **2.04 FIRE RATED GLASS**

- A. Fire-Protection-Rated Glazing For Door Lites: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire-rating period.
  - 1. Glass Type: Specialty tempered float glass.
  - 2. Meet safety glazing requirements indicated in performance requirements.
  - 3. Meet fire door assembly criteria for "D", and "H" labels as indicated in the performance requirements.
  - 4. Glazing Method: As required for fire rating.
  - 5. Fire-Rating: As indicated.
  - 6. Products: Provide one of the following products or a comparable product from one of the other manufacturers specified for fire rated glass.
    - a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite X: [www.safti.com](http://www.safti.com).

#### **2.05 ACCESSORIES**

- A. Setting Blocks: EPDM or neoprene, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: EPDM or neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
  - 1. Width: As required for application.
  - 2. Thickness: As required for application.
- D. Glazing Gaskets and Splines: Resilient EPDM or polyvinyl chloride extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- E. Glazing Clips: Manufacturer's standard type.

- F. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- G. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- H. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

## **2.06 VISION LITE KITS FOR FIRE RATED DOOR GLAZING**

- A. At Contractor's option, instead of glass stops provided by door manufacturers, provide fire rated glass manufacturer's standard vision lite kits for installing fire-rated glass in doors.
  - 1. Moldings: Minimum 20 gage, 0.036 inch, thick steel.
  - 2. Profile: Manufacturer's standard profiles.
  - 3. Door Lite Sizes: As indicated on Drawings.
  - 4. Fire Ratings: As indicated on Drawings.
  - 5. Finish: Manufacturer's standard primer.
  - 6. Basis-of-Design Product: Provide SAFTIFIRST, a division of O'Keeffe's Inc.; Vision Kits: [www.safti.com](http://www.safti.com), or a comparable product from any of the manufacturers specified for firerated glass.

## **PART 3 EXECUTION**

### **3.01 VERIFICATION OF CONDITIONS**

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

### **3.03 INSTALLATION, GENERAL**

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Use one or more of the specified glazing methods as recommended by GANA, glass manufacturer, and installer, and as required to comply with performance requirements.
- C. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- D. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- E. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- F. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- G. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

### **3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)**

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

### **3.05 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)**

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

- B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- F. Carefully trim protruding tape with knife.

### **3.06 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)**

- A. Application - Interior Glazed: Set glazing infills from the interior of the building.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- E. Place glazing tape on free perimeter of glazing in same manner described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- G. Carefully trim protruding tape with knife.

### **3.07 INSTALLATION - FIRE-RATED GLAZING UNITS**

- A. Install fire-rated glazing in compliance with written instructions of fire-rated glazing manufacturer as required to maintain specified fire rating.
  - 1. Use glazing method and materials as indicated by the fire rated glazing manufacturer as required to maintain specified fire-rating.

### **3.08 CLEANING**

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

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### **3.09 PROTECTION**

- A. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

**END OF SECTION 088000**



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## **SECTION 092116**

### **GYPSUM BOARD ASSEMBLIES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Gypsum wallboard.
- C. Tile backing board.
- D. Finishing materials.
- E. Trim accessories.
- F. Acoustical accessories
- G. Fasteners and adhesives

##### **1.02 RELATED REQUIREMENTS**

- A. Section 061000 - Rough Carpentry: Building framing.
- B. Section 092216 - Non-Structural Metal Framing.

##### **1.03 REFERENCE STANDARDS**

- A. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- C. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.
- F. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

- H. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- I. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).
- J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- K. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).
- L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- N. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- O. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.
- P. GA-226 - Application of Gypsum Board to Form Curved Surfaces; 2025.
- Q. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.

#### **1.04 SUBMITTALS**

- A. See Section 013300 - Submittal Procedures for submittal procedures.
- B. Product Data: Provide data on gypsum wallboard, finishing materials, trim accessories, acoustical accessories, and fasteners and adhesives.
- C. Shop Drawings: Include locations of Expansion (Control) joints. Coordination drawings for proposed joint locations may be annotated copies of Construction Documents architectural floor plans, reflected ceiling plans, and interior elevations. Submit prior to commencement of framing installation. Coordinate with requirements specified in Section 09 2216.
- D. Samples:
  - 1. Submit three samples of each type of special trim, 4 inches in length.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least 5 years of documented experience.

- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

#### **1.07 FIELD CONDITIONS**

- A. Environmental Limitations: Comply with requirements of ASTM C840 or gypsum board manufacturer's written recommendations, whichever is more stringent.

### **PART 2 PRODUCTS**

#### **2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
  - 1. See PART 3 for finishing requirements.
- B. Fire-Rated Assemblies: For fire-resistance-rated assemblies that incorporate gypsum board, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 and as follows:
  - 1. Provide construction equivalent to one of the following:
    - a. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD)
    - b. Gypsum Association File Numbers: Provide construction complying with requirements of GA-600 for the particular assembly.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- D. Horizontal Deflection: For wall assemblies, limit maximum deflection of wall framing to L/240 at 5 psf .
  - 1. Exception: Limit deflection of walls to receive hard tile surfaces to L/360 at 5 psf.

## 2.02 BOARD MATERIALS

- A. Gypsum Wallboard - Type X: Paper-faced gypsum panels with fire-resistant core; ASTM C1396/C1396M.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  2. Thickness: 5/8 inch.
  3. Long Edges: Tapered with paper face wrapping edge.
  4. Short Edges: Square cut.
  5. Sized to minimize joints.
  6. Type: Fire resistance rated Type X, UL or WH listed.
  7. Products:
    - a. CertainTeed Corp.; Type X Gypsum Board: [www.certainteed.com](http://www.certainteed.com).
    - b. Continental Building Products; Firecheck Type X: [www.continental-bp.com](http://www.continental-bp.com).
    - c. Georgia-Pacific Gypsum; ToughRock Fireguard X: [www.gp.com](http://www.gp.com).
    - d. National Gypsum Company; Gold Bond Brand Fire-Shield Gypsum Board: [www.nationalgypsum.com](http://www.nationalgypsum.com).
    - e. USG Corporation; Sheetrock Brand Firecode X Panels: [www.usg.com](http://www.usg.com).
    - f. Substitutions: See Section 01 6000 - Product Requirements.
- B. Impact Resistant Gypsum Wallboard: Heavy paper-faced, mold and moisture resistant, gypsum panel with fire-resistant core; ASTM C1396/C1396M.
1. Thickness: 5/8 inch.
  2. Long Edges: Tapered with paper face wrapping edge.
  3. Short Edges: Square cut.
  4. Sized to minimize joints.
  5. Type: Fire resistance rated Type X, UL or WH listed.
  6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  7. Surface Abrasion: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
  8. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
  9. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.

10. Hard Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
11. Products:
  - a. CertainTeed Corp.; Extreme Impact Resistant Gypsum Board: [www.certainteed.com](http://www.certainteed.com).
  - b. Continental Building Products; Protecta HIR 300 Type X with Mold Defense:
  - c. National Gypsum Company; Gold Bond Brand Hi-Impact XP Gypsum Board: [www.nationalgypsum.com](http://www.nationalgypsum.com).
  - d. USG Corporation; Sheetrock Brand Mold Tough VHI Firecode X Panels: [www.usg.com](http://www.usg.com).
  - e. Substitutions: See Section 01 6000 - Product Requirements.

### **2.03 TILE BACKING BOARDS**

- A. Cementitious Backer Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
  1. Thickness: 5/8 inch.
  2. Flame Spread/Smoke Developed: 0/0 per ASTM E84.
  3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  4. Locations: Wet areas and elsewhere as indicated on Drawings; including, but not limited to, the following:
    - a. Showers.
  5. Products:
    - a. National Gypsum Company; PermaBase Brand Cement Board: [www.nationalgypsum.com](http://www.nationalgypsum.com).
    - b. USG Corporation; Durock Brand Cement Board: [www.usg.com](http://www.usg.com).
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- B. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
  1. Thickness: 5/8 inch.
  2. Type: Fire resistance rated Type X, UL or WH listed.
  3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

4. Locations: Non-wet areas and elsewhere as indicated on Drawings; including, but not limited to, the following:
  - a. Kitchens.
  - b. Laundry areas.
  - c. Locker rooms.
  - d. Toilet rooms.
5. Products:
  - a. CertainTeed Corp.; GlasRoc Diamondback Tile Backer: [www.certainteed.com](http://www.certainteed.com).
  - b. Georgia-Pacific Gypsum; DensShield Tile Backer: [www.gp.com](http://www.gp.com).
  - c. National Gypsum Company; Gold Bond Brand eXP Tile Backer: [www.nationalgypsum.com](http://www.nationalgypsum.com).
  - d. USG Corporation; Durock Brand Glass-Mat Tile Backerboard: [www.usg.com](http://www.usg.com).
  - e. Substitutions: See Section 01 6000 - Product Requirements

#### **2.04 FINISHING MATERIALS**

- A. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
  1. Paper Tape: 2 inch wide, creased paper tape for joints and corners.
  2. Manufacturers: Provide products from one of the specified gypsum wallboard manufacturers.
  3. Joint Compound: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
    - a. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
    - b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
      - 1) Use setting-type compound for installing paper-faced metal trim accessories.
    - c. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
    - d. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.

- e. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound, drying-type, or all-purpose compound.
  - 1) Contractor's option high-build drywall surfacer may be used instead of traditional trowelapplied Level 5 skim-coating process.
    - (a) High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
    - (b) Products: Subject to compliance with requirements, provide one of the following:
      - (1) CertainTeed Corp.; Level V Wall and Ceiling Primer/Surfacer with M2Tech: [www.certainteed.com](http://www.certainteed.com).
      - (2) USG Corporation; Tuff-Hide Primer-Surfacer: [www.usg.com](http://www.usg.com).

## 2.05 TRIM ACCESSORIES

- A. Trim Accessories: ASTM C1047, extruded aluminum alloy (6063 T5), galvanized steel sheet ASTM A924/A924MG90, or rolled zinc, unless noted otherwise.
  - 1. Types: As detailed or required for finished appearance. Including, but not limited to, the following:
    - a. Corner beads.
    - b. Expansion (Control) joints.
    - c. LC or L bead at exposed edges.
  - 2. Products:
    - a. ClarkDietrich Building Systems: [www.clarkdietrich.com](http://www.clarkdietrich.com).
    - b. MarinoWARE: [www.marinoware.com](http://www.marinoware.com).
    - c. Telling Industries; [www.buildstrong.com](http://www.buildstrong.com).
    - d. Phillips Manufacturing Co: [www.phillipsmfg.com](http://www.phillipsmfg.com).
    - e. USG Corporation: [www.usg.com](http://www.usg.com).
    - f. Substitutions: See Section 01 6000 - Product Requirements.
- B. Special Trims: Extruded aluminum profiles; ASTM B221 6063 T5 alloy.
  - 1. Basis-of-Design Manufacturers: The following manufacturers establish the standard of quality for products specified. Equivalent products from other manufacturers may be

submitted for approval, provided they meet all specified performance and appearance criteria.

- a. Fry Reglet Corp.; [www.fryreglet.com](http://www.fryreglet.com).
  - b. Gordon, Inc.; [www.gordon-inc.com](http://www.gordon-inc.com).
  - c. Pittcon Industries; [www.pittconindustries.com](http://www.pittconindustries.com).
  - d. Substitutions: See Section 01 6000 - Product Requirements.
2. Shapes and Profiles: As indicated on Drawings, including, but not limited to, the following:
- a. Reveals: Equal to Fry Reglet Model DRM-625-625.
    - 1) Reveal Size: 5/8 inch wide by 5/8 inch deep.
  - b. F-Reveals: Equal to Fry Reglet Model DRMF-625-625.
    - 1) Reveal Size: 5/8 inch wide by 5/8 inch deep
  - c. Finish: As selected by the Architect from the manufacturer's standard conversion coating or factory-applied primer finish.

## **2.06 ACOUSTICAL ACCESSORIES**

- A. Acoustic Insulation: Provide one of the following types:
1. Mineral Fiber/Rock Wool Batts: ASTM C665; preformed mineral fiber, friction fit type,
    - a. Thickness: 3 inches, unless otherwise indicated.
    - b. Density: 2.5 pcf.
    - c. Flame Spread/Smoke Developed: 0/0 per ASTM E84.
    - d. Products:
      - 1) JohnsManville; Mineral Wool Sound Attenuation Fire Batts (SAFB):[WWW.JM.COM](http://WWW.JM.COM).
      - 2) Owens Corning; Thermafiber SAFB (Sound Attenuation Fire Batts): [WWW.OWENSCORNING.COM](http://WWW.OWENSCORNING.COM).
      - 3) Rockwool; Safe'n'Sound: [www.rockwool.com](http://www.rockwool.com).
      - 4) Substitutions: See Section 01 6000 - Product Requirements.
  2. Fiberglass Batts: ASTM C665; preformed glass fiber, friction fit type, unfaced.
    - a. Thickness: 3-1/2 inches, unless otherwise indicated.
    - b. Products:
      - 1) CertainTeed Corporation/Saint-Gobain; NoiseReducer Sound Attenuation BATTS: [WWW.CERTAINTEED.COM](http://WWW.CERTAINTEED.COM).

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- 2) Johns Manville; Formaldehyde-Free Fiberglass Insulation: [www.jm.com](http://www.jm.com).
  - 3) Knauf Insulation; EcoBatt Insulation with ECOSE Technology: [WWW.KNAUFINSULATION.COM](http://WWW.KNAUFINSULATION.COM).
  - 4) Owens Corning Corporation; EcoTouch Sound Attenuation Batts: [www.owenscorning.com](http://www.owenscorning.com).
  - 5) Substitutions: See Section 01 6000 - Product Requirements.
- B. Acoustical Sealant: Nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Reduces airborne sound transmission through perimeter joints and openings in wall assemblies.
1. Products:
    - a. Franklin International Inc; Titebond GreenChoice Professional Acoustical Smoke & Sound Sealant: [www.titebond.com](http://www.titebond.com).
    - b. PPG Architectural Coatings; Liquid Nails AS-825 Acoustical Sound Sealant: [www.liquidnails.com](http://www.liquidnails.com).
    - c. Pecora Corporation; AC-20 FTR: [www.pecora.com](http://www.pecora.com).
    - d. Pecora Corporation; AIS-919: [www.pecora.com](http://www.pecora.com).
    - e. United States Gypsum Co.; USG Sheetrock Brand Firecode Smoke-Sound Sealant: [www.usg.com](http://www.usg.com).
    - f. United States Gypsum Co.; USG Sheetrock Brand Acoustical Sealant: [www.usg.com](http://www.usg.com).
    - g. Substitutions: See Section 01 6000 - Product Requirements.

## **2.07 FASTENERS AND ADHESIVES**

- A. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- B. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- C. Anchorage to Other Substrates: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place
- D. Laminating Adhesive: For directly adhering gypsum-base, face-layer panels to backing-layer panels in multi-layer construction. Provide one of the following types:
  1. Joint Compound: As recommended by gypsum board manufacturer.

2. Adhesives:
  - a. Franklin International, Inc; Titebond GREENchoice Professional Drywall Adhesive;  
www.titebond.com.
  - b. PPG Architectural Coatings; Liquid Nails DWP-24 Drywall Construction Adhesive:  
www.liquidnails.com.
  - c. Substitutions: See Section 01 6000 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.
- B. Expansion (Control) Joint Layout: Prior to commencement of framing and gypsum board installation, submit coordination drawings indicating proposed control joint locations in metal-framed gypsum board-sheathed partitions, walls, ceilings, bulkheads, fasciae, and soffits, for review and acceptance of Architect. Coordinate with requirements of Section 09 2216.
- C. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 GENERAL INSTALLATION**

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions.

#### **3.03 ACOUSTIC ACCESSORIES INSTALLATION**

- A. General: Apply acoustic accessories at all STC-Rated Assemblies and elsewhere as indicated
  1. Apply acoustic sealant at all smoke-tight assemblies.
  2. Fire-Rated Construction: Install acoustic accessories in strict compliance with requirements of assembly listing
- B. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- C. Acoustic Sealant: Install in accordance with manufacturer's instructions.
  1. Comply with ASTM C919.
  2. Place continuous bead at perimeter of each layer of gypsum board.
  3. Seal around all penetrations by conduit, pipe, ducts, rough-in boxes, and similar items, except where firestopping is provided.

### **3.04 BOARD INSTALLATION**

- A. Install to minimize butt end joints, especially in highly visible locations.
  - 1. Use screws for attachment of gypsum board.
  - 2. Use screws for attachment of cementitious backing board.
- B. Single-Layer Non-Rated: Install gypsum board parallel to framing, with long edges occurring over framing.
  - 1. Stagger joints on opposite sides of partitions.
- C. Multi-Layer Non-Rated: Install first layer of gypsum board parallel to framing with long edges occurring over framing. Place second layer parallel to framing with long edges occurring over framing, and joints offset from joints of first layer.
  - 1. Offset face-layer joints at least one stud or furring member from base-layer joints.
  - 2. Stagger joints on opposite sides of partitions.
  - 3. Install additional layers beyond double layers similarly; maintain offset and staggered
  - 4. Apply laminating adhesive between layers of gypsum board for bonding of layers in addition to fasteners.
- D. Impact Resistant Gypsum Board:
  - 1. Install at partition adjacent to the baggage claim and security booth areas.
  - 2. Height: Full height.
- E. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- F. Cementitious Backing Board: Install in accordance with ANSI A108.11 and manufacturer's instructions.
- G. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

### **3.05 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
  - 1. Not more than 30 feet apart on walls and ceilings, unless otherwise indicated.
  - 2. Submit control joint locations to Architect for approval prior to installation.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim (LC or L Beads): Install at locations where gypsum board abuts dissimilar materials and as indicated, using longest practical lengths.
- D. Special Trim: Install at indicated locations, and as follows.

1. Wall End Caps: Provide at all exposed ends of wall assemblies not covered in wallboard and at locations of partition closures.
2. Use longest practical lengths.
- E. Partition Closures: Locate at vertical junctures between end of wall assemblies and windows, glazing, and similar construction, unless otherwise indicated.
  1. Notch around horizontal mullions, sills, or other obstructions leaving appropriate gap for differential movement between the sound barrier wall end cap and the obstruction.
  2. Apply continuous bead of acoustical sealant to the unexposed side of extruded aluminum surface that will be in contact with the wall edge.
  3. Place sound barrier partition closure on the vertical surface of the wall partition and loosely install fasteners in the top and bottom slotted holes of the wall end cap.
  4. Plumb the partition closure leaving recommended gap spacing between the interior glass surface and the wall end cap. Foam gasket to be in contact with glass.
  5. Tighten top and bottom fasteners to secure partition closure.
  6. Install additional fasteners at 12 inches on center, minimum.
  7. Install snap cover to conceal fasteners.
  8. Apply color matched sealant at joints of dissimilar materials.

### 3.06 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
  2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  3. Level 3: Walls to receive textured wall finish.
  4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
  5. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

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1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
2. Taping, filling, and sanding are not required at base layer of double-layer applications.

### **3.07 TOLERANCES**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

**END OF SECTION 092116**



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## **SECTION 092216**

### **NON-STRUCTURAL METAL FRAMING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Metal partition framing.
- B. Suspension systems for interior ceilings and soffits
- C. Framing accessories.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 061000 - Rough Carpentry: Wood blocking within stud framing.
- B. Section 061000 - Rough Carpentry: Wall sheathing.
- C. Section 092116 - Gypsum Board Assemblies: Gypsum board partition.

##### **1.03 REFERENCE STANDARDS**

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- F. ASTM E413 - Classification for Rating Sound Insulation; 2022.

##### **1.04 SUBMITTALS**

- A. See Section 013300 - Submittal Procedures for submittal procedures.
- B. Shop Drawings:
  - 1. Indicate component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and control joints.

2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
3. Coordinate with Section 09 2900.
- C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Metal Framing, Connectors, and Accessories:
  1. ClarkDietrich: [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
  2. Jaimes Industries: [www.jaimesind.com/#sle](http://www.jaimesind.com/#sle).
  3. Marino: [www.marinoware.com/#sle](http://www.marinoware.com/#sle).
  4. Simpson Strong Tie: [www.strongtie.com/#sle](http://www.strongtie.com/#sle).
  5. Steel Construction Systems: [www.steelconsystems.com/#sle](http://www.steelconsystems.com/#sle).
  6. Telling Industries; \_\_\_\_\_: [www.tellingindustries.com/#sle](http://www.tellingindustries.com/#sle).
  7. The Steel Network, Inc; \_\_\_\_\_: [www.SteelNetwork.com/#sle](http://www.SteelNetwork.com/#sle).
  8. Substitutions: See Section 016000 - Product Requirements.

#### **2.02 PERFORMANCE REQUIREMENTS**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Suspended Gypsum Board Ceilings, Soffits, and Bulkheads: Design and install to provide deflection of not more than 1/360 of distance between supports.

- C. Interior Metal Stud/Gypsum Board Assemblies: Design and install to withstand lateral loading (air pressure) of 5 PSF with deflection limit not more than 1/240 of partition height.
- D. Interior Metal Stud/Gypsum Board Assemblies at Locations with Ceramic Tile or Other Hard Surface Finishes: Design and install to withstand lateral loading (air pressure) of 5 with deflection limit not more than 1/360 of partition height.
- E. Where documents indicate a stud size, size shall be considered minimum. Increase gage to meet minimum performance requirements.
- F. Accommodate building structure deflections in connections to structure.
- G. Protective Coatings: Equivalent (EQ) coatings are not acceptable; products shall be hot-dip galvanized as indicated.
- H. Embossed (equivalent thickness) steel framing products are not acceptable; products shall be in steel thicknesses indicated.

## **2.03 FRAMING MATERIALS**

- A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated.
  - 1. Protective Coating: ASTM A653/A653M, G60, hot-dip galvanized.
  - 2. Minimum Metal Thickness: 0.030 inch (20 gage).
  - 3. Framing Depths: As indicated.
  - 4. Profiles:
    - a. Studs: C shaped with flat or formed webs.
    - b. Runners: U shaped, sized to match studs.
      - 1) Where indicated or required, provide slip-type head joints using slotted deflection track.
    - c. Ceiling Channels: C shaped.
    - d. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- B. Slotted Deflection Track: Provide galvanized sheet steel track with slotted holes in flanges for mechanical anchorage of studs that accommodate deflection; provide screws and anti-friction bushings. Slotted connections prevent stud rotation without use of lateral bracing and maintains structural performance of partition.
  - 1. Provide at partition heads to structure connections.

2. Shall prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above.
  3. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
  4. Comply with ASTM C645 and ASTM C754.
  5. Protective Coating: ASTM A653/A653M, G60, hot-dip galvanized.
  6. Minimum Metal Thickness: Same material thickness as studs.
  7. Track Depth: Matching studs.
- C. Resilient Furring Channels: Galvanized sheet steel, single leg, asymmetrical channel, 1/2 inch deep with a 1-1/4 inch screw flange; complying with ASTM C645.
1. Exception: At ceilings provide double leg, symmetrical channels.
  2. Protective Coating: ASTM A653/A653M, G40, hot-dip galvanized.
  3. Minimum Metal Thickness: 0.0179 inch (25 gage).
- D. Z-shaped Furring: Galvanized sheet steel z-shaped furring, 2 inches deep, unless otherwise indicated; complying with ASTM C645.
1. Protective Coating: ASTM A653/A653M, G60, hot-dip galvanized.
  2. Minimum Metal Thickness: 0.0312 inch (20 gage).

#### **2.04 FRAMING ACCESSORIES**

- A. Bridging and Bracing Members: Of same material as studs; thickness to suit purpose;
1. Steel, 0.0538-inch (1.37mm) minimum base-metal thickness, with a minimum 1/2-inch (13mm) wide flanges.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich Systems Spazzer 9200 Bridge and Spacing Bar, or equivalent.
- B. Backing Plates: 0.064 inch thick (16 gage), galvanized.
- C. Wood Blocking: Refer to Section 06 1000 - Rough Carpentry.
- D. Anchorage Devices: Powder actuated or Drilled expansion bolts.
- E. Isolation Strip: Foam gasket, ASTM D3575, closed-cell vinyl foam strips, 1/8 inch thick, in width to suit steel stud size.
1. Manufacturer:
    - a. Williams; Everlastic EVA 200; [www.williamsproducts.net](http://www.williamsproducts.net).
    - b. Substitutions: See Section 01 6000 - Product Requirements

## 2.05 SUSPENSION SYSTEMS

- A. Carrying Channels: ASTM C955; cold-rolled galvanized steel sheet U-channel.
  - 1. Protective Coating: ASTM A653/A653M, G60, hot-dip galvanized.
  - 2. Minimum Metal Thickness: 0.064 inch (16 gage).
  - 3. Depth: 2 inches unless otherwise indicated.
- B. Furring Channels:
  - 1. Hat-Shaped, Rigid Furring Channels: As specified in "Framing Materials" above.
  - 2. Resilient Furring Channels: As specified in "Framing Materials" above.
- C. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch (16 gage) diameter or double strand of 0.048-inch (18 gage) diameter wire.
- D. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch (8 gage) diameter.
- E. Hanger Attachments to Concrete:
  - 1. Expansion Anchors: Fastener systems with evaluations based on ICC-ES AC193.
  - 2. Adhesive Anchors: Fastener systems with evaluations based on ICC-ES AC308.
  - 3. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
  - 4. Material for Exterior Locations and Interior Wet/Humid Locations: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
  - 1. At Contractor's option provide grid suspension system instead of traditional carrying and furring channels.
  - 2. Not permitted for multi-layer gypsum board systems.
  - 3. Manufacturers:
    - a. Armstrong World Industries, Inc.; Drywall Grid Suspension System:  
[www.armstrongceilings.com](http://www.armstrongceilings.com).
    - b. CertainTeed/Saint-Gobain; Quickspan Locking Drywall Grid System:  
[www.certainteed.com](http://www.certainteed.com).
    - c. Rockfon, Part of the Rockwool Group; Chicago Metallic Drywall Grid:  
[www.rockfon.com](http://www.rockfon.com).

- d. USG Corporation: Drywall Suspension System: [www.usg.com](http://www.usg.com).
- e. Substitutions: See Section 01 6000 - Product Requirements.

## **2.06 FABRICATION**

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.
- C. Examine areas and substrates for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION OF STUD FRAMING**

- A. Install non-structural members in accordance with ASTM C754.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install bracing at terminations in assemblies.
- D. For interior non-load bearing walls indicated to terminate above suspended ceilings provide 20-gauge stud diagonal bracing of walls at door openings, corner wall intersections and at maximum 10'-0" intervals to structural supports or substrates above. Otherwise extend framing full height to structural supports or substrates above suspended ceilings.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- F. Extend partition framing to structure where indicated and to 4 inches above ceiling in other locations unless otherwise indicated..
- G. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling framing in accordance with details.
- H. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in

accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

- I. Align and secure top and bottom runners at 24 inches (600 mm) on center.
- J. Curved Partitions:
  - 1. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
  - 2. Begin and end each arc with a stud, and space intermediate studs equally along arcs.
- K. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- L. Install studs vertically at 16 inches (400 mm) on center, unless otherwise indicated.
  - 1. Install studs so flanges within framing system point in same direction
- M. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- N. Align stud web openings horizontally.
- O. Secure studs to tracks using fastener method. Do not weld.
- P. Stud splicing is not permissible.
- Q. Fabricate corners using a minimum of three studs.
- R. Install double studs at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.
- S. Brace stud framing system rigid.
- T. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- U. Blocking/Backing: Use metal backing plate, wood blocking, or supplementary framing secured to studs. Provide blocking/backing for support of equipment services, plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and similar construction.
- V. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches (150 mm).
- W. Do not bridge building control and expansion joints. Frame both sides of joints independently.
  - 1. Install Horizontal stiffeners in stud system, spaced (vertical distance) not more than 4'-6" o.c.
- X. General requirements and locations of control joints in metal-framed gypsum board
  - 1. General: Comply with requirements of ASTM C840, and as noted below:

- a. Control joints shall be constructed with manufactured control joint trim, or field fabricated from materials as specified.
- b. Control joints will be installed where a partition, wall, or ceiling traverses and construction joint (expansion, or building control element) in the base building structure.
- c. Control joints will be installed where a wall or partition extends in an uninterrupted straight plane exceeding 30 linear feet. Door and/or window frames that extend full height of partitions will be considered equivalent to control joint construction.
- d. Control joints in interior ceilings, bulkheads, fasciae and soffits will be installed so that linear dimensions between control joints do not exceed 30 linear feet and total area between control joints does not exceed 900 square feet. Control joints will be installed to isolate wings of "L", "U: and "T" shaped ceiling and soffit areas.
- e. A control joint will be installed where ceiling, bulkhead, fascia and soffit framing members change direction.
- f. Provide appropriate backing material, fire-safing insulation, and sealant for control joints installed in acoustical or fire-rated construction, as required to maintain firerating and/or acoustical separation.

### **3.03 CEILING SUSPENSION SYSTEMS**

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- E. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated.
  1. Hanger spacing not to exceed 48 inches on center.
  2. Do not attach hangers to the following:
    - a. Metal deck or rolled-in hanger tabs of composite metal deck.
    - b. Permanent metal forms.
    - c. Ducts, pipes, or conduit.

3. 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.
4. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
5. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support 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 requirements
- F. Space main carrying channels at maximum 48 inches (\_\_\_\_ mm) on center, and not more than 6 inches (150 mm) from wall surfaces. Lap splice securely.
- G. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- H. Place furring channels perpendicular to carrying channels, not more than 2 inches (50 mm) from perimeter walls, and rigidly secure. Lap splices securely.
  1. Space furring channels at maximum 24 inches on center.
- I. Laterally brace suspension system.
- J. Grid Suspension Systems:
  1. Attach perimeter wall angle where grid suspension systems meet vertical surfaces.
  2. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

### **3.04 TOLERANCES**

- A. Maximum Variation From True Position: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet (3 mm in 3 m).
- C. Maximum Variation From Level: 1/8 inch in 10 feet.

**END OF SECTION 092216**



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## **SECTION 093000**

### **TILING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Hard tile.
- B. Thresholds.
- C. Setting materials.
- D. Waterproofing and crack isolation membranes.
- E. Trim and accessories.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 092116 - Gypsum Board Assemblies: Tile backer board.

##### **1.03 REFERENCE STANDARDS**

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2024.
- B. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- C. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.
- D. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2023.
- E. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.
- F. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2023.
- G. ANSI A118.5 - American National Standard Specifications for Chemical Resistant Furan Mortars and Grouts for Tile Installation; 1999 (Reaffirmed 2021).
- H. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.

- I. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.
- J. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.
- K. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.
- L. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2024).
- M. ANSI A118.13 - American National Standard Specification for Bonded Sound Reduction Membranes for Thin-Set Ceramic Tile Installation; 2014 (Reaffirmed 2024).
- N. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2023.
- O. ANSI A136.1 - American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile; 2020.
- P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- Q. ANSI A137.3/A108.19/A108.20 - American National Standard Specifications for Gauged Porcelain Tile and Gauged Porcelain Tile Panels/Slabs; 2021.
- R. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials; 2021.
- S. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- T. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- U. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).
- V. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

#### **1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples:
  - 1. Full-size units of each type of tile and each color and finish.
  - 2. Full-size units of each type of trim, threshold and accessory for each color and finish.
    - a. Trim and Threshold Samples: 4 inches long, minimum.
- E. Installer's qualification statement.
- F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Tile: 2 percent of each size, color, and surface finish combination, but not less than one of each type.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- B. Installer Qualifications:
  - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
- C. Provide setting materials, grouts, and waterproofing and crack isolation membrane materials from one manufacturer.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.
- B. Storage: Store materials as directed by manufacturer's written instructions.

#### **1.08 FIELD CONDITIONS**

- A. Do not install solvent-based products in an unventilated environment.

- B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
  - 1. Obtain setting and grouting materials from single manufacturer.
  - 2. Obtain waterproofing and crack isolation membrane from manufacturer of setting and grouting materials.

### **2.02 PERFORMANCE REQUIREMENTS**

- A. Floor tile and other traffic surfaces:
  - 1. Dynamic Coefficient of Friction: Not less than 0.42 when tested in accordance with DCOF AcuTest per ANSI A137.1.

### **2.03 PRODUCTS, GENERAL**

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation methods, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

#### **2.04 TILE**

- A. Match-Existing Tile: Where patching or new work abuts existing tile, furnish ceramic/porcelain tile complying with ANSI A137.1, Standard Grade, selected to match existing in size/module and calibration, color/tone/pattern, surface finish/sheen and texture, edge profile, and nominal thickness; provide trim shapes and grout (joint width and color) to match.
  1. Manufacturer: open as required to achieve the match.
  2. Slip resistance: Proposed tile shall meet ANSI A326.3 and be suitable for the area of use.
  3. Final selection and any substitutions are subject to approval by WCAA and Westin.

#### **2.05 TRIM AND ACCESSORIES**

- A. Trim Units: Provide bullnoses, cove bases, corners, and other shapes required for a complete installation.
  1. Match Existing: Where patching or new work abuts existing tile, provide coordinating trim that matches existing in profile/radius, size or module, color/tone, finish/sheen, and thickness.
  2. If Match Is Not Feasible: Provide manufacturer's standard coordinating trim compatible with the selected field tile; coordinate profiles and sizes with adjacent tile for module and jointing; color and finish to match the field tile. Manufacturer to be same as adjacent field tile where available; otherwise open as required to achieve the match.
  3. Approval: Final selection and any substitutions are subject to approval by WCAA and Westin.

#### **2.06 THRESHOLDS**

- A. Thresholds, General:
  1. Beveled Edges:
    - a. Maximum Height: 1/2 inch.
    - b. Bevel Slope: 1:2 slope.
    - c. Align lower bevel edge with adjacent floor finish.
    - d. Finish bevels to match threshold face.
- B. Thresholds, Match Existing:

1. Where thresholds exist, provide new work to match existing in material, color, finish, and profile, and appropriate for the transition between adjacent floor finishes.
2. Final selection and any substitutions are subject to approval by WCAA and Westin.
- C. Where no match is possible or no existing threshold is present, provide a new threshold appropriate for the transition:
  1. Solid Surfacing Thresholds: Plastic resin casting complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler or unfilled, and pigments; homogenous, non-porous; no surface coating; color and pattern consistent throughout thickness.
    - a. Size: 4 inches wide by full width of opening; 1/2 inch thick; beveled long edge, both sides.
    - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
    - c. Final selection and any substitutions are subject to approval by WCAA and Westin.

## **2.07 SETTING MATERIALS**

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Bostik, Inc; Bostik PM: [www.bostik.com](http://www.bostik.com).
    - b. Custom Building Products; VersaBond Flex Professional Thin-Set Mortar: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
    - c. LATICRETE International, Inc; 253 Gold: [www.laticrete.com](http://www.laticrete.com).
    - d. MAPEI Corp.; Porcelain Tile Mortar: [www.mapei.com](http://www.mapei.com).
    - e. TEC, H.B. Fuller Construction Products Inc.; Full Flex Premium Thin Set Mortar: [www.tecspecialty.com](http://www.tecspecialty.com).
  2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
  3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- B. Large Format Tile, Modified Dry-Set Mortar (Medium-Bed): Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of up to 3/4 inch.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Bostik, Inc; Big Tile & Stone: [www.bostik.com](http://www.bostik.com).

- b. Custom Building Products; Natural Stone & Large Tile Premium Mortar:  
[www.custombuildingproducts.com](http://www.custombuildingproducts.com).
  - c. LATICRETE International, Inc; 4-XLT: [www.laticrete.com](http://www.laticrete.com).
  - d. MAPEI Corp.; Large Tile & Stone Mortar: [www.mapei.com](http://www.mapei.com).
  - e. TEC, H.B. Fuller Construction Products Inc; Ultimate Large Tile Mortar or Ultraflex LFT: [www.tecspecialty.com](http://www.tecspecialty.com).
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
  3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- C. Mortar Bed Materials (Thick-Bed): ANSI A108.02
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Bostik, Inc; Mud-In-A-Bag with 425 Multi-Purpose Acrylic Latex Admixture:  
[www.bostik.com](http://www.bostik.com).
    - b. Custom Building Products; Thick Bed Bedding Mortar with Thin-Set & Mortar Admix:  
[www.custombuildingproducts.com](http://www.custombuildingproducts.com).
    - c. LATICRETE International, Inc; 3701 Fortified Mortar: [www.laticrete.com](http://www.laticrete.com).
    - d. MAPEI Corp.; Modified Mortar Bed: [www.mapei.com](http://www.mapei.com).
    - e. TEC, H.B. Fuller Construction Products Inc.; Floor Mud with Acrylond AMA Acrylic Mortar Additive: [www.tecspecialty.com](http://www.tecspecialty.com).
  2. Provide prepackaged, dry-mortar mix that either contains a dry, redispersible, vinyl acetate or acrylic additive or has a separately packaged liquid-latex additive. only water must be added at Project site after mixing prepackaged ingredients
  3. At Contractor's option a field mixed mortar bed may be used instead of the specified prepackaged materials. Comply with ANSI A108.1a and the following:
    - a. Mortar mix to include Portland cement, sand, and hydrated lime, and water in ratios complying with ANSI A108.1a, Article 2.2
  4. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A185 and ASTM A82, except for minimum wire size.

## 2.08 GROUTS

- A. High-Performance Grout: ANSI A118.7.

1. Grout Color: Match existing adjacent grout; verify in field. Final color selection is subject to approval by WCAA and Westin.
2. Products: Pre-mixed Single-Component Grout: High-performance formulation; stain resistant; no sealer required. Subject to compliance with requirements, provide one of the following:
  - a. Bostik, Inc; TruColor RapidCure: [www.bostik.com](http://www.bostik.com).
  - b. Custom Building Products; Fusion Pro Single Grout: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
  - c. LATICRETE International, Inc; Ready-To\_use Grout: [www.laticrete.com](http://www.laticrete.com).
  - d. MAPEI Corp.; Flexcolor CQ: [www.mapei.com](http://www.mapei.com).
  - e. TEC, H.B. Fuller Construction Products Inc; InColor Advanced Performance Grout:

## **2.09 WATERPROOFING AND CRACK ISOLATION MEMBRANE**

- A. Waterproofing and Crack Isolation Membrane: ANSI A118.10 and ANSI A118.12.
  1. System consisting of liquid-latex rubber or elastomeric polymer; with or without fabric reinforcement
  2. Thickness: As recommended by membrane manufacturer.
  3. Crack Resistance: No failure at 1/8 inch gap, minimum.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Without Fabric Reinforcing:
    - a. Custom Building Products; RedGuard: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
    - b. LATICRETE International, Inc; Hydro Ban: [www.laticrete.com](http://www.laticrete.com).
    - c. MAPEI Corp.; Mapelastic AquaDefense: [www.mapei.com](http://www.mapei.com).
  2. With Fabric Reinforcing:
    - a. Bostik, Inc; GoldPlus: [www.bostik.com](http://www.bostik.com).
    - b. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
    - c. LATICRETE International, Inc; Hydro Barrier: [www.laticrete.com](http://www.laticrete.com).
    - d. MAPEI Corp.; Mapelastic AquaDefense: [www.mapei.com](http://www.mapei.com).
    - e. TEC, H.B. Fuller Construction Products Inc; HydraFlex: [www.tecspecialty.com](http://www.tecspecialty.com).

## 2.10 METAL TRIM

- A. Metal Trim: Metallic edge trim, height to match tile and setting-bed thickness, designed specifically for tiling applications; stainless steel, ASTM A276 or ASTM A666, 300 Series exposed-edge material.
1. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
    - a.
  2. Profiles:
    - a. Angle or L-shaped: Equal to Schluter-Systems JOLLY: [www.schluter.com](http://www.schluter.com)
    - b. Angle or L-shaped, Bullnose: Equal to Schluter-Systems RONDEC-DB: [www.schluter.com](http://www.schluter.com).
    - c. Other shapes as appropriate for the application.
  3. Finish: Match existing; otherwise provide brushed stainless steel.

## 2.11 MISCELLANEOUS MATERIALS

- A. Joint Sealants
1. Tile Sealants - Traffic Grade: Provide Nonsag traffic grade silicone sealant or self-leveling silicone sealant.
  2. Tile Sealant - Non-traffic Grade: Gunnable siliconized acrylic; moisture and mildew resistant type.
    - a. Colors: To match adjacent grout colors.
    - b. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Bostik, Inc; Bosti-Flex Plus: [www.bostik.com](http://www.bostik.com).
      - 2) Custom Building Products; Polyblend Ceramic Tile Caulk: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
      - 3) LATICRETE International, Inc; Premium Acrylic Caulk: [www.laticrete.com](http://www.laticrete.com).
      - 4) MAPEI Corp.; Keracaulk S (sanded) and Keracaulk U (unsanded): [www.mapei.com](http://www.mapei.com).
      - 5) TEC, H.B. Fuller Construction Products Inc; AccuColor Sanded/Unsanded Siliconized Acrylic Caulk: [www.tecspecialty.com](http://www.tecspecialty.com).

- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- C. Trowelable Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

## **2.12 MIXING MORTARS AND GROUT**

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding
  - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
  - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable patching compound specifically recommended by tile-setting material manufacturer.
- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

### **3.03 INSTALLATION OF TILE**

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation methods.
- B. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in specified TCNA installation methods.
- C. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
  - 1. Exterior tile floors.
  - 2. Tile floors in wet areas.
  - 3. Tile swimming pool decks.
  - 4. Tile floors in laundries.
  - 5. Tile floors consisting of tiles 8 by 8 inches or larger.
  - 6. Tile floors consisting of rib-backed tiles.
- D. Bond Coats:
  - 1. Use latex-portland cement thin-set mortar, unless otherwise indicated.
    - a. Exceptions:
      - 1) For tiles that have at least one side greater than 15 inches long, use large format tile latex-portland cement medium-bed mortar.
    - b. Bond Coat Color: White or gray.
- E. Grout:
  - 1. Use high performance grout, unless otherwise indicated.

- F. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- G. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- H. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges except where metal trim is indicated.
- I. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- J. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so
  - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
  - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- K. Joint Widths: Install tiles with joint widths indicated, if not indicated install in widths as directed by Architect in writing.
- L. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- M. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- N. Thresholds: Install thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

- O. Metal Edge Strips: Install in same type of setting bed as adjacent tile unless otherwise indicated.

### **3.04 INSTALLATION OF WATERPROOF MEMBRANE**

- A. Install waterproofing and crack isolation membrane to comply with ANSI A108.13, ANSI A108.17 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing and crack isolation membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- C. Locations: Install waterproofing and crack isolation membrane at the following locations:
  - 1. All floor and traffic areas.
  - 2. Shower walls and floors.
  - 3. Other areas as indicated on Drawings.

### **3.05 ADJUSTING AND CLEANING**

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

### **3.06 PROTECTION**

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

### **3.07 INTERIOR FLOOR TILE - INSTALLATION METHODS**

#### **A. Interior Floor Tile Installations:**

- 1. Concrete Substrates - Thinset Installation: Install in accordance with TCNA F122 or F122A as appropriate for substrate conditions.
  - a. Provide waterproofing and crack isolation membrane.
  - b. Bond Coat: Modified dry-set or medium-bed, modified dry-set mortar as appropriate to tile.
  - c. Grout: High-performance grout.
- 2. Concrete Substrates - Bonded Mortar Bed Installation: Install in accordance with TCNA F112.
  - a. Provide waterproofing and crack isolation membrane.
  - b. Bond Coat: Modified dry-set or medium-bed, modified dry-set mortar as appropriate to tile.
  - c. Grout: High-performance grout.

#### **B. Interior Floor Tile Installations at Bonded Mortar Bed Shower Pans:**

- 1. Concrete Shower Substrates - Bonded Mortar Bed Installation: Install in accordance with TCNA B415 or B421 as appropriate for wall construction.
  - a. Provide waterproofing and crack isolation membrane.
  - b. Bond Coat: Modified dry-set or medium-bed, modified dry-set mortar as appropriate to tile.
  - c. Grout: High-performance grout.

### **3.08 INTERIOR WALL TILE - INSTALLATION METHODS**

#### **A. Interior Wall Tile Installations:**

- 1. Concrete and Masonry Substrates – Thinset Installation: Install in accordance with TCNA W202I.
  - a. Provide waterproofing and crack isolation membrane at specified locations and as indicated on Drawings.
  - b. Bond Coat: Modified dry-set or medium-bed, modified dry-set mortar as appropriate to tile.

- c. Grout: High-performance grout.
  2. Cementitious Backing Panel Substrates - Thinset Installation: Install in accordance with TCNA W244C.
    - a. Provide waterproofing and crack isolation membrane at specified locations and as indicated on Drawings.
    - b. Bond Coat: Modified dry-set or medium-bed, modified dry-set mortar as appropriate to tile.
    - c. Grout: High-performance grout.
  3. Glass-Mat Backing Panel Substrates - Thinset Installation: Install in accordance with TCNA W245.
    - a. Provide waterproofing and crack isolation membrane at specified locations and as indicated on Drawings.
    - b. Bond Coat: Modified dry-set or medium-bed, modified dry-set mortar as appropriate to tile.
    - c. Grout: High-performance grout.
- B. Shower Wall Tile Installations at Bonded Mortar Bed Shower Pans:
  1. Cementitious Backing Panel Substrates: Install in accordance with TCNA B415.
    - a. Provide waterproofing and crack isolation membrane.
    - b. Bond Coat: Modified dry-set or medium-bed, modified dry-set mortar as appropriate to tile.
    - c. Grout: High-performance grout.
  2. Concrete and Masonry Substrates: Install in accordance with TCNA B421.
    - a. Provide waterproofing and crack isolation membrane.
    - b. Bond Coat: Modified dry-set or medium-bed, modified dry-set mortar as appropriate to tile.
    - c. Grout: High-performance grout.

**END OF SECTION 093000**



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P24010\_002 DTW ADA  
IMPROVEMENTS, ADULT  
CHANGING ROOMS AND BABY  
CHANGING COUNTERS  
Romulus, Michigan

P24010-002

IFB Set

09-05-2025

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## **SECTION 099100**

### **PAINTING**

#### **PART 1 - GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Do Not Paint or Finish the Following Items:
  - 1. Items factory-finished unless otherwise indicated; materials and products having factory applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
  - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
  - 6. Marble, granite, slate, and other natural stones.
  - 7. Floors, unless specifically indicated.
  - 8. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
  - 9. Glass.
  - 10. Acoustical materials, unless specifically indicated.
  - 11. Concealed pipes, ducts, and conduits.

##### **1.02 DEFINITIONS**

- A. Conform to ASTM D16 for interpretation of terms used in this section

##### **1.03 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2019.
- C. ASTM D523 - Standard Test Method for Specular Gloss; 2025.
- D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

- E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- F. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- G. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- H. SSPC-SP 16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals; 2020.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures
- B. Product Data: For each type of product. Include preparation requirements and application instructions. Include the following:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category.
    - a. Example of general product categories:
      - 1) Interior finish coat - latex, eggshell.
  - 2. For each paint system and substrate, indicate which paint products are to be used.
    - a. Examples:
      - 1) Interior latex eggshell system for gypsum board:
        - (a) Primer: Name of specific product provided.
        - (b) Finish Coats: Name of specific product provided.
- C. Samples: Submit 3 paper "draw down" samples, 8-1/2 by 11 inches (279.4 mm) in size, illustrating each color and sheen specified.
- D. Qualification Data: For installer and manufacturer.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 5 years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years documented experience.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees Fahrenheit (7.22 degrees Celsius) and a maximum of 90 degrees Fahrenheit (32.22 degrees Celsius), in ventilated area, and as required by manufacturer's instructions.

### **1.07 FIELD CONDITIONS**

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees Fahrenheit (35 degrees Celsius).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 degrees Fahrenheit (-15 degrees Celsius) 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.
- C. Apply paint only to dry, clean, and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Source Limitations:
  - 1. Provide paint and coating products from same manufacturer, unless otherwise specified.
  - 2. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats, unless otherwise specified.
  - 3. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
  - 4. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

B. Basis-of-Design Manufacturers: Subject to compliance with requirements, provide products of PPG Industries, Inc., Architectural Coatings: [www.ppgpaints.com](http://www.ppgpaints.com), or approved substitution products of one of the following manufacturers:

1. Benjamin Moore: Benjamin Moore & Co.: [www: benjaminmoore.com](http://www.benjaminmoore.com).
2. Sherwin-Williams: The Sherwin-Williams Company: [www: sherwin-williams.com](http://www.sherwin-williams.com).

## **2.02 PAINT MATERIALS, GENERAL**

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. VOC Content:

1. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
2. For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits unless stricter limits are required by authorities having jurisdiction:
  - a. Flat Paints and Coatings: 50 g/L.
  - b. Nonflat Paints and Coatings: 50 g/L.
  - c. Dry-Fog (Dryfall) Coatings: 150 g/L.
  - d. Primers, Sealers, and Undercoaters: 100 g/L.
  - e. Rust-Preventive Coatings: 100 g/L.
  - f. Zinc-Rich Industrial Maintenance Primers: 100 g/L.

C. Supply each paint material in quantity required to complete entire project's work from a single production run.

D. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

E. Sheen/Gloss Criteria.

1. Product names are not acceptable as gloss level identification.

2. Determine gloss value of paint finish by testing paint samples according to ASTM D523, using 60 degree geometry. Sheen/Gloss levels shall be defined as follows:
    - a. Gloss Level 1: Flat/Matte, value between 0 and 5 units.
    - b. Gloss Level 2: Velvet, value between 5 and 10 units.
    - c. Gloss Level 3: Eggshell, value between 10 and 20 units.
    - d. Gloss Level 4: Satin, value between 20 and 35 units.
    - e. Gloss Level 5: Semigloss, value between 35 and 70 units.
    - f. Gloss Level 6: Gloss, value between 70 and 85 units.
    - g. Gloss Level 7: High Gloss, value more than 85 units.
  3. Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- F. Colors: As indicated in Room Finish Schedule on Drawings.
1. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as indicated color.
  2. Provide tinted deep tone primers at deep tone colors, and as recommended by paint manufacturer.

### **2.03 INTERIOR PAINTS**

- A. General:
1. Unless otherwise indicated, each interior paint system consists of the following:
    - a. Primer: One coat based on substrate material.
    - b. Finish Coats: Two coats based on required sheen and substrate material.
  2. Required Sheens: For each paint system, provide paint sheens as follows unless otherwise indicated:
    - a. Ceilings, Soffits and Ceiling Drops: Flat sheen.
    - b. Gypsum Board (except at ceilings):
      - 1) Semigloss Sheen: Storage rooms, janitor closets, electrical rooms, mechanical rooms, closets, and similar non-public areas.
      - 2) Eggshell Sheen: Public areas.
    - c. Masonry: Semigloss sheen.
    - d. Metals: Semigloss sheen.
- B. Interior Primers.

1. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
  - a. Basis-of-Design Product: PPG Speedhide® 6-2 Interior Quick-Drying Latex Sealer.
  - b. Applied at a dry film thickness of not less than 1.0 mil (0.0254 mm), or greater to provide full coverage.
  - c. Substitutions: See Section 01 6000 - Product Requirements.
2. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
  - a. Basis-of-Design Product: PPG Speedhide® 6-208/212 rust inhibitive steel primer Industrial Enamel.
  - b. Applied at a dry film thickness of not less than 1.5 mils (0.0381 mm), or greater to provide full coverage.
  - c. Substitutions: See Section 01 6000 - Product Requirements.
3. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.
  - a. Basis-of-Design Product: PPG Pitt-Tech® 90-712/709 One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
  - b. Applied at a dry film thickness of not less than 3.0 mils (0.0762 mm), or greater to provide full coverage.
  - c. Substitutions: See Section 01 6000 - Product Requirements.
4. Interior/Exterior Concrete Unit Masonry Block Filler: Factory-formulated, high-build latex block filler for CMU and concrete.
  - a. Basis-of-Design Product: PPG Speedhide® 6-15XI Hi-Fill Block Filler.
  - b. Applied at a dry film thickness of not less than [8.0] mils ([0.2032] mm), or greater as required to fill surface voids and provide full coverage.
  - c. Substitutions: See Section 01 6000 - Product Requirements.
5. Interior Concrete and Masonry Primer: Factory-formulated, alkali-resistant acrylic primer/sealer for interior concrete, brick, stucco, and other masonry; suitable for new masonry with elevated pH; low-odor, low-VOC.
  - a. Basis-of-Design Product: PPG PERMA-CRETE® Alkali-Resistant Primer 4-603XI (interior/exterior).

- b. Applied at a dry-film thickness of not less than [2.0] mils ([0.0508] mm), or greater as required to uniformly seal the substrate and provide full coverage; follow manufacturer's recoat/cure guidance.
  - c. Substitutions: See Section 01 6000 - Product Requirements.
- C. Interior Finish Coats.
- 1. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.
    - a. Basis-of-Design Product: PPG Speedhide® 6-70 Line Interior Wall Flat-Latex Paint.
    - b. Applied at a dry film thickness of not less than 1.0 mil (0.0254 mm), or greater to provide full coverage.
    - c. Substitutions: See Section 01 6000 - Product Requirements.
  - 2. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
    - a. Basis-of-Design Product: PPG Speedhide® 6-400 Series Eggshell Acrylic Latex Enamel.
    - b. Applied at a dry film thickness of not less than 1.25 mils (0.03175 mm), or greater to provide full coverage.
    - c. Substitutions: See Section 01 6000 - Product Requirements.
  - 3. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
    - a. Basis-of-Design Product: PPG Speedhide® 6-500 Series Interior Semi-Gloss Latex.
    - b. Applied at a dry film thickness of not less than 1.0 mil (0.0254 mm), or greater to provide full coverage.
    - c. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.04 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide cleaning materials, preparation materials, and miscellaneous materials required to properly prepare and apply paints and coatings.
  - 1. Includes materials required for marking fire and smoke assemblies

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Masonry (Clay and CMUs): 12 percent.
  - 2. Gypsum Board: 12 percent.
  - 3. Gypsum Plaster: 12 percent.
  - 4. Portland Cement Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### **3.02 PREPARATION**

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Protect adjacent surfaces not to be painted.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. For coatings applied over previously painted surfaces, test application to check for lifting and other adhesion problems. Perform test in an isolated area where practicable.
  - 2. Remove incompatible coatings and primers or apply barrier tie coat as recommended by paint manufacturer and as required to produce paint systems indicated.
- D. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates - Unpainted or Unprimed: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
  - 1. SSPC-SP 6 - Commercial Blast Cleaning.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Sand and scrape to remove loose primer and rust. Feather edges of remaining primer to make inconspicuous.
  - 1. Before painting, applicator/installer shall re-prime entire shop-primed item with primer specified in this section.
- H. Galvanized-Metal Substrates: Remove passivation coating/rinse, grease and oil residue from galvanized metal to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Clean using methods recommended in writing by paint manufacturer but not less than ASTM D6386, ASTM D7396, and the following:
  - 1. Remove surface contamination and oils in accordance with SSPC-SP 1 - Solvent Cleaning.
  - 2. Remove loose paint, rust, and other debris according to SSPC-SP 2 - Hand Tool Cleaning.
  - 3. Lightly profile galvanized surfaces and remove zinc oxide and zinc hydroxide layers in accordance with SSPC-SP 16 – Brush-Off/Sweep Blast Cleaning.
  - 4. Apply paint within 1 hour of cleaning and preparation.
- I. Previously Painted Surfaces - General:
  - 1. Remove all surface contamination such as, oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, and any other surface contamination.
  - 2. Remove masking tape, labels, adhesives, and other materials that would either be deleterious to adhesion of, or show through, new paint.
  - 3. Scrape all loose, blistered, peeling, scratched or otherwise imperfect paint down to bare substrate and sand adjacent tightly adhering paint to feather edge.
  - 4. Spot prime all bare areas with appropriate primer before priming entire surface.
- J. Repair of Existing Gypsum Board and Plaster:

1. Fill hairline cracks, small holes, and imperfections with filler compound and sand smooth.
- K. Repair of Existing Cementitious Plaster:
  1. Fill hairline cracks, small holes, and imperfections with exterior patching plaster and make smooth.

### **3.03 APPLICATION - GENERAL**

- A. Apply paints and coatings according to manufacturer's written instructions.
  1. Use applicators and techniques suited for paint and substrate indicated.
- B. Provide smooth, opaque coatings of uniform finish, color, appearance, and coverage without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
- C. Terminate paint in neat lines; cut in sharp lines and color breaks.
- D. Apply paint products to properly prepared surfaces.
  1. Do not apply coatings over dirt, rust, scale, grease, moisture, or other conditions detrimental to application of coatings.
- E. Primers:
  1. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
  2. Apply first coat of primer to surfaces as soon as practical after preparation and before subsequent surface deterioration.
  3. Re-prime shop-primed surfaces.
- F. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
  1. Sand between coats as recommended by manufacturer; before applying next coat clean surfaces of loose particles and use tack cloth to remove any remaining dust and particles just prior to applying next coat.
- G. Provide completed work matching approved samples for color, sheen, texture, coverage and quality of work.
  1. Remove, refinish, or repaint work not complying with requirements.
- H. Number of Coats: Each paint system in Part 2 specifies a number of coats. This is the minimum number required.

1. If undercoats, stains, or other imperfections are visible after final coat of paint, apply additional coats until paint is of uniform finish, color, and appearance without defects or imperfections.
- I. Minimum Coating Thickness: Provide dry film thickness for each coating as indicated, but not less than that recommended by the coating manufacturer.
  1. Number of coats and film thicknesses required are same regardless of application method.
  2. Ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.

### **3.04 SURFACES TO BE PAINTED**

- A. General: Paint all exposed surfaces except where indicated not to be painted or where listed in "Surfaces Not to Be Painted" Article in this Section.
  1. The term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.
  2. If surface, material, or item is not specifically mentioned, paint in same manner, color, and sheen as similar surfaces, materials, or items, regardless of whether indicated or not.
  3. Paint surfaces that are cut and patched including, but not limited to, cutting and patching to permit installation of electrical services, piping, and ductwork.
- B. Exposed Ceilings:
  1. Paint entire exposed ceiling area including, but not limited to, deck, miscellaneous steel, hangers, fasteners, and miscellaneous items and hardware, unless otherwise indicated.
  2. Paint the following mechanical and electrical items unless otherwise indicated:
    - a. Insulated piping, pipe hangers, and supports.
    - b. Ductwork, insulated ducts, and supports.
    - c. Conduit, fittings, and junction boxes.
  3. Do not paint sprinkler heads and other factory-finished fire protection components.
- C. Equipment and Furniture:
  1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.
  2. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of permanent item.

- D. Registers and Grilles: Paint interior surfaces of ducts, for a minimum of 18 inches or beyond sight line, whichever is greater, with a flat black (non-reflecting) paint.
- E. Access Panels: Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
- F. Doors:
  - 1.
- G. Panelboards for Service Panels, Telephone, and Other Electrical Equipment:
  - 1. Paint both sides and all edges of plywood before installation.
    - a. Color and Sheen: Gray, semigloss, unless otherwise indicated.
- H. Mechanical and Electrical:
  - 1. This Section includes painting of all mechanical, fire protection, and electrical items.
    - a. Do not paint sprinkler heads and polished fire protection components.
    - b. Do not paint insulated pipe, duct work or equipment before insulation is applied.
  - 2. Piping, Insulated Piping, Pipe Hangers, and Supports:
    - a. In finished/public areas, paint exposed piping the same color and sheen as surface it is mounted on unless otherwise indicated.
    - b. In utility areas, paint exposed piping according to piping color coding scheme; otherwise paint the same color and sheen as surface it is mounted on unless otherwise indicated.
  - 3. Paint all exposed pipe hangers and supports the same color and sheen as surface it is mounted on unless otherwise indicated.
    - 1) Any portion of hangers and supports encompassing the actual pipe shall be painted to match the pipe color and sheen.
  - 4. Ductwork, Insulated Ducts, and Supports:
    - a. In finished/public areas, paint exposed ductwork and supports the same color and sheen as surface it is mounted on unless otherwise indicated.
    - b. In utility areas, paint exposed ductwork according to color coding scheme; otherwise paint the same color and sheen as surface it is mounted on unless otherwise indicated.
    - c. Paint all exposed hangers and supports the same color and sheen as surface it is mounted on unless otherwise indicated.

- 1) Any portion of hangers and supports encompassing the actual ductwork shall be painted to match the ductwork color and sheen.
5. Electrical Conduit, Fittings and Junction Boxes:
  - a. In finished/public areas, paint exposed conduit, fittings and junction boxes same color and sheen as surface it is mounted on unless otherwise indicated.
  - b. In utility areas, paint exposed conduit, fittings and junction boxes according to color coding scheme; otherwise paint the same color and sheen as surface it is mounted on unless otherwise indicated.
6. Mechanical and Electrical Equipment:
7. Exterior Equipment: Paint all equipment exposed to the weather.
  - 1) Do not paint factory-finished equipment unless otherwise indicated.
  - b. Paint shop-primed mechanical and electrical equipment same color and sheen as surface it is mounted on unless otherwise indicated.
  - c. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
  - d. Paint interior surfaces of convector and baseboard heating cabinets to match face panels.

### 3.05 FIELD QUALITY CONTROL

- A. Subject to the opinion of the Architect, paint shall be rejected and considered unacceptable for any of the following reasons:
  1. Lacking minimum dry film thicknesses.
  2. Poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, and corners.
  3. Damage from touching, or disturbing paint in any other manner, before sufficiently dry.
  4. Damage from application to moist surfaces or damage caused by inadequate protection from the weather.
  5. Damage or contamination of paint from blown contaminants including but not limited to dust.
  6. Paint shall be rejected if any of the following are evident under natural lighting for exterior surfaces and final lighting source, including daylighting, for interior surfaces:
    - a. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 48 inches (1219.2 mm).

- b. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 48 inches (1219.2 mm).
  - c. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles from a distance of not less than 48 inches (1219.2 mm).
- B. Visible defects are defined as follows:
- 1. Brush and roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
  - 2. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.
- C. Rejected paint shall be repaired or replaced at the expense of the Contractor.
- 1. Small affected areas shall be touched up.
  - 2. Large affected areas shall be repainted.
  - 3. Small and large areas shall be as defined by the Architect.
  - 4. Areas without sufficient dry film thickness shall be repainted.
  - 5. Paint runs and sags shall be removed by scraper or sanding and repainted.

### **3.06 CLEANING AND PROTECTION**

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
  - 1. Do not clean equipment with free-draining water. Prevent solvents, thinners, cleaners, and other contaminants from entering waterways, sanitary and storm drain systems, and ground.
  - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
  - 3. Allow empty paint cans to dry before disposal.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### **3.07 SCHEDULE - PAINT SYSTEMS**

- A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
1. Flat Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior flat acrylic paint.
  2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- B. Ferrous Metal: Provide the following finish systems over ferrous metal:
1. Flat Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Interior ferrous-metal primer.
    - b. Finish Coats: Interior flat acrylic paint.
  2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior ferrous-metal primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior ferrous-metal primer.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- C. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
1. Flat Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Interior zinc-coated metal primer.
    - b. Finish Coats: Interior flat acrylic paint.
  2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior zinc-coated metal primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.

3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
  - a. Primer: Interior zinc-coated metal primer.
  - b. Finish Coats: Interior semigloss acrylic enamel.
- D. Concrete and Masonry (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
  1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior concrete and masonry primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  2. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior concrete and masonry primer.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- E. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
  1. Flat Acrylic Finish: Two finish coats over a block filler.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior flat acrylic paint.
  2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a block filler.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  3. Semigloss Acrylic-Enamel Finish: Two finish coats over a block filler.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior semigloss acrylic enamel.

**END OF SECTION 099100**

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P24010\_002 DTW ADA  
IMPROVEMENTS, ADULT  
CHANGING ROOMS AND BABY  
CHANGING COUNTERS  
Romulus, Michigan

P24010-002

IFB Set

09-05-2025

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## **SECTION 101423**

### **PANEL SIGNAGE**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Panel signage.

##### **1.02 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

##### **1.03 COORDINATION**

- A. General: Coordinate work of this Section with Owner and Architect prior to fabrication to ensure accuracy of content and consistency with the existing airport signage system.
- B. Room Names and Numbers: Verify final room names, numbers, and other text to be applied with Owner. Do not fabricate signage until written confirmation of correct wording is obtained.
- C. Graphics and Layout: Verify letter sizes, font styles, colors, and other graphic requirements with Owner, consistent with ADA Standards and existing airport signage system.
- D. Submittal Coordination: Provide shop drawings and message schedules indicating all text, sizes, colors, and mounting locations. Do not proceed with fabrication until submittals are reviewed and approved.

##### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
  - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
  - 2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

- a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
  - b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
  - c. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.
- E. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.
- F. Manufacturer's qualification statement.

#### **1.05 QUALITY ASSURANCE**

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

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Package signs as required to prevent damage before installation.
- B. Store tape adhesive at normal room temperature.

#### **1.07 FIELD CONDITIONS**

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain minimum ambient temperature during and after installation.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Panel Signage: Subject to compliance with requirements of this Section and approval by Owner, provide products from one of the following manufacturers.
- 1. Best Sign Systems, Inc: [www.bestsigns.com/#sle](http://www.bestsigns.com/#sle).
  - 2. FASTSIGNS International, Inc: [www.fastsigns.com/#sle](http://www.fastsigns.com/#sle).
  - 3. Inpro Corporation: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  - 4. Mohawk Sign Systems, Inc: [www.mohawksign.com/#sle](http://www.mohawksign.com/#sle).
  - 5. Seton Identification Products: [www.seton.com/aec/#sle](http://www.seton.com/aec/#sle).

6. Vista System LLC: [www.vistasystem.com/#sle](http://www.vistasystem.com/#sle).
7. Substitutions: Other manufacturers may be considered if products comply with requirements of this Section and are approved by Owner.

## **2.02 REGULATORY REQUIREMENTS**

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

## **2.03 PANEL SIGNAGE**

- A. Panel Signage: Provide interior panel signage consistent with the existing airport signage system in style, materials, colors, and overall design characteristics, unless otherwise indicated. Sizes, configurations, and mounting heights shall be as indicated on Drawings, updated as required to comply with ADA Standards, while maintaining a consistent appearance throughout the facility.
  1. Applications: Provide room identification, restroom, informational, and regulatory signage as indicated on Drawings and as required for code compliance.
  2. Construction: Flat panel signs with tactile characters raised 1/32 inch minimum and Grade II Braille, fabricated in full compliance with ADA Standards.
  3. Materials: Provide laminated plastic, acrylic, or photopolymer signage to match existing airport signage system, suitable for high-traffic public facilities. Final material selection shall be subject to Owner's approval.
  4. Sizes and Thickness: As indicated on Drawings; not less than 1/8 inch (3 mm). Match existing airport signage system where applicable.
  5. Colors and Fonts: Match existing airport signage standards for background and character colors. Provide contrasting colors for readability. Fonts shall be sans-serif, consistent with the airport's signage system and ADA requirements.
  6. Frames and Mounting: Provide frames, if required, to match existing airport signage standards in profile, material, and finish. Mounting heights and locations shall comply with ADA Standards and as indicated on Drawings.
  7. Finish: Matte, non-glare finish in compliance with ADA Standards.

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P24010\_002 DTW ADA  
IMPROVEMENTS, ADULT  
CHANGING ROOMS AND BABY  
CHANGING COUNTERS  
Romulus, Michigan

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## **2.04 ACCESSORIES**

- A. Adhesives: Manufacturer's recommended permanent, pressure-sensitive, double-sided tape or construction adhesive suitable for substrate conditions.
- B. Mounting Brackets/Frames: Where frames are used, provide aluminum or steel profiles matching existing airport signage system, with finish as scheduled.
- C. Templates and Installation Accessories: Provide alignment templates, spacers, and guides to ensure consistent mounting heights and alignments in accordance with ADA Standards.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage, repair or replace damaged items.

**END OF SECTION 101423**

## **SECTION 102113.13**

### **METAL TOILET COMPARTMENTS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Metal toilet compartments and accessories.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 102800 - Toilet, Bath, and Laundry Accessories.

##### **1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on shop drawings.
- B. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

##### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets for each type of product indicated. Include fabrication details, description of materials and finishes.
- C. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show locations of cutouts for compartment-mounted toilet accessories.
  - 2. Show locations of reinforcements for compartment-mounted grab bars.
- D. Samples for Verification: Furnish physical sample of material in selected finish.
  - 1. Size: 2 by 2 inch (52 by 52 mm) minimum, in type of finish specified.

#### **PART 2 PRODUCTS**

##### **2.01 PERFORMANCE REQUIREMENTS**

- A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

- B. Graffiti Resistance: Partition material shall have the following graffiti removal characteristics when tested in accordance with ASTM D6578-00 Standard Practice for Determination of Graffiti Resistance in accordance with Section 9, "Graffiti Removal Procedure Using Manual Solvent Rubs":
1. Cleanability: Surface shall facilitate easy removal of paint and marker ink; graffiti shall clean without ghosting TB-80.
- C. Scratch Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2197-98(2002) Standard Test Method for Adhesion of Organic Coating by Scrape Adhesion, using Gardner Stock #PA-2197/ST pointed stylus attachment on scrape tester:
1. Scratch Resistance: Maximum Load Value shall exceed 10 kilograms.
- D. Impact Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2794-93(1999)e1 Standard Test Method for Resistance of Organic Coating to the Effects of Rapid Deformation (Impact), using 0.625" hemispherical indenter with 2-lb impact weight:
- 1.
- E. Fire Resistance: Partition material shall comply with the following requirements, when tested in accordance with ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials:
1. Smoke Developed Index: Not to exceed 450.
  2. Flame Spread Index: Not to exceed 75.
  3. Material Fire Ratings:
    - a. National Fire Protection Association (NFPA): Class B.
    - b. International Code Council (ICC): Class B.

## **2.02 STAINLESS STEEL TOILET COMPARTMENTS**

- A. Toilet Compartment Type:
1. Basis of Design Product: Subject to compliance with requirements, provide Stainless Steel material units as manufactured by Bradley, or approved equal, to match existing.
- B. Door, Panel, and Pilaster:
1. Basis of Design Product: Toilet partitions shall be constructed of stainless steel material, in color and Pattern: To match existing.

- C. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.

### **2.03 ACCESSORIES**

- A. Hardware, Heavy Duty: Manufacturer's heavy-duty stainless steel castings, including stainless steel tamper-resistant fasteners:
1. Hinges: Self-closing continuous spring-loaded type, adjustable to hold doors open at any angle up to 90 degrees, with emergency access by lifting door. Mount with stainless steel through-bolts.
    - a. Basis of Design product: Subject to compliance with requirements, provide Bradley S0136 continuous spring-loaded stainless-steel piano hinge with tamper-resistant fasteners, or approved equal.
  2. Latch and Keeper: Surface-mounted slide latch with rubber-faced combination door strike and keeper, with provision for emergency access, meeting requirements for accessibility at accessible compartments.
  3. Coat Hook: As specified in Section 10 28 00, Toilet, Bath, and Laundry Accessories.
  4. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.
    - a. Basis of Design product: Subject to compliance with requirements, provide Bradley HDWC-S0110 stainless-steel door pull with tamper-resistant fasteners, or approved equal.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that field measurements are as indicated.
- C. Verify correct spacing of and between plumbing fixtures.
- D. Verify correct location of built-in framing, anchorage, and bracing.

### **3.02 INSTALLATION**

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
- B. Install toilet partitions and screens in spaces with operating, temperature controlled HVAC systems. Shield partitions and screens from direct sunlight.
- C. Clearances: Install with clearances indicated on Drawings. Where clearances are not indicated, allow maximum 1/2 inch (13 mm) between pilasters and panels, and 1 inch (25 mm) between panels and walls.
- D. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
  - 1. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
  - 2. Align brackets at pilasters with brackets at walls.

### **3.03 ADJUSTING**

- A. Hardware Adjustment:
  - 1. Non-accessible compartments: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.
  - 2. Accessible compartments: Set hinges so doors self-close and fully latch when released, with closing speed/force in compliance with the ADA Standards and the requirements of the authorities having jurisdiction. No hold-open is permitted.

### **3.04 FINAL CLEANING**

- A. Remove packaging and construction debris and legally dispose of off-site
- B. Clean partition and screen surfaces with materials and cleansers in accordance with manufacturer's recommendations.

**END OF SECTION 102113.13**

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## **SECTION 102800**

### **TOILET, BATH, AND LAUNDRY ACCESSORIES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Commercial toilet, shower and bath accessories.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 081113 - Hollow Metal Doors and Frames
- B. Section 087100 - Door Hardware.
- C. Section 093000 - Tiling
- D. Section 102113.13 - Metal Toilet Compartments.
- E. Section 224000 - Plumbing Fixtures.

##### **1.03 COORDINATION**

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

##### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Include electrical characteristics.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated on Drawings.
  - 2. Identify accessories using designations indicated on Drawings.

- D. Samples: For each exposed product and for each finish specified, full size.
  - 1. Approved full-size Samples will be returned and may be used in the Work.
- E. Qualification Data: For manufacturer and installer.
- F. Sample Warranty: For manufacturer's special warranties.
- G. Maintenance Data: For accessories to include in maintenance manuals.

### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

### **1.06 WARRANTY**

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, visible silver spoilage defects.
  - 2. Warranty Period: 15 years from date of Substantial Completion.
    - a. Exception: Electric hand dryers: 5 years from date of Substantial Completion.

## **PART 2 PRODUCTS**

### **2.01 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Design accessories and fasteners to comply with the following requirements:
  - 1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
  - 2. Shower Seats: Installed units are able to resist 350 lbf applied in any direction and at any point.

### **2.02 MATERIALS**

- A. Stainless Steel: ASTM A240 or ASTM A666, Type 304, 0.031-inch-minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B19, flat products; ASTM B16, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

- C. Steel Sheet: ASTM A1008, Designation CS (cold rolled, commercial steel), 0.036-inch-minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A653, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A153, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

### **2.03 FABRICATION**

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosionresistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

### **2.04 COMMERCIAL TOILET , SHOWER AND BATH ACCESSORIES**

- A. Mirror Unit:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ASI-American Specialties, Inc.
    - b. Bobrick Washroom Equipment, Inc.
    - c. Bradley Corporation.
  - 2. Frame: Stainless steel angle.
    - a. Corners: Manufacturer's standard welded frame.
  - 3. Hangers: Manufacturer's standard rigid, tamper and theft resistant.
  - 4. Size: As indicated on Drawings but not less than 24 inches wide by 30 inches high.
  - 5. Basis of Design product: Subject to compliance with requirements, provide Bradley Model 781, stainless steel channel-frame mirror, or approved equal.
- B. Operable Mirror Unit:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:

- a. Nameeks Brand.
  2. Frame: Mounted Circular Brass Make-up.
    - a. Corners: Manufacturer's standard welded frame.
  3. Size: 8" diameter.
  4. Basis of Design product: Subject to compliance with requirements, provide Nameeks AR7705-CR-7X makeup mirror with swit, or approved equal.
- C. Grab Bar:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ASI – American Specialties, Inc.
    - b. Bobrick Washroom Equipment, Inc.
    - c. Bradley Corporation.
    - d. Gamco Commercial Restroom Accessories.
  2. Mounting: Flanges with concealed fasteners.
  3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
    - a. Finish: Smooth, ASTM A480/A480M No. 4 (satin) on ends and slip-resistant texture in grip area.
  4. Outside Diameter: 1-1/2 inches (38 mm).
  5. Configuration and Length: As indicated on Drawings
    - a. Sizes indicated on Drawings are minimum length for each location.
  6. Basis of Design product: Subject to compliance with the requirements of this Section, provide the following products as indicated on the Drawings; or approved equal.
    - a. Evans Terminal Keynote 01: Bobrick B-5806.99 × 24.
    - b. Evans Terminal Keynote 10: Bobrick B-5806.99 × 36.
    - c. Westin Hotel Keynote 16: Bobrick B-5806.99 × 36.
    - d. Westin Hotel Keynote 24: Gamco 125E×42 and Gamco 125×18.
- D. Coat Hook:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ASI – American Specialties, Inc.
    - b. Bobrick Washroom Equipment, Inc.
    - c. Bradley Corporation.

2. Material/Construction: Type 304 stainless steel with No. 4 (satin) finish; heavy-duty construction with rounded, snag-resistant profile and concealed mounting.
3. Fasteners: Manufacturer's standard tamper-resistant stainless-steel fasteners. Provide through-bolts/six bolts at toilet partitions and security screws into solid blocking at walls.
4. Mounting Height: As indicated on Drawings.
5. Basis-of-Design Products: Subject to compliance with requirements, provide the following, or approved equal:
  - a. Evans Terminal Keynote 02: Bradley B-233 coat hook, satin stainless steel finish.
  - b. Westin Hotel Keynote 23: Bobrick B-542 coat hook, satin stainless-steel finish.

E. Raised Toilet Seat

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Bemis Manufacturing Company.
  - b. Centoco.
  - c. American Standard Brands.
2. Type: Commercial-duty raised toilet seat for elongated bowls; provide height necessary to achieve required seat height on installed fixture.
3. Material/Finish: Molded plastic, white; manufacturer's standard smooth, cleanable surface.
4. Hinges/Attachment: Manufacturer's heavy-duty, corrosion-resistant hinges and mounting hardware; secure attachment to existing bowl. Provide tamper-resistant fasteners where exposed.
5. Mounting Height: Coordinate with plumbing to provide 17–19 inches AFF seat height at accessible fixtures.
6. Basis-of-Design Product: Subject to compliance with requirements, provide Bemis Model 2L2155T-000, elongated, raised plastic seat, white, or approved equal.

F. Fold-down Shower Bench

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Bobrick Washroom Equipment, Inc.
  - b. Bradley Corporation.
  - c. ASI–American Specialties, Inc.
2. Configuration: L-shaped seat, designed for wheelchair access.

3. Seat: Phenolic or polymeric composite.
    - a. Construction: Slat-type or one-piece, manufacturer's standard.
  4. Mounting Mechanism: Stainless-steel support frame, No. 4 satin finish.
    - a. Hardware: Manufacturer's standard rigid, tamper- and theft-resistant.
  5. Size and Mounting: As indicated on Drawings.
  6. Basis of Design product: Subject to compliance with requirements, provide Bobrick Model B-5181, or approved equal.
- G. Locker Room Bench
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Salsbury Industries.
    - b. WB Manufacturing, LLC.
  2. Configuration: Floor-mounted ADA locker room bench with pedestal supports; provide backrest where indicated.
  3. Materials:
    - a. Seat: Hardwood butcher-block or laminated wood, manufacturer's standard clear protective finish.
    - b. Supports/Frame: Stainless-steel pedestal and backrest frame, No. 4 satin finish.
  4. Size: As indicated on Drawings; comply with ADA dimensional requirements. Provide seat width 20 inches minimum and length 42 inches minimum where scheduled.
  5. Anchorage: Anchor benches securely to substrate with manufacturer's recommended fasteners; provide stainless-steel hardware.
  6. Basis of Design product: Subject to compliance with requirements, provide the following, or approved equal:
    - a. Evans Terminal: Salsbury Industries 77782-ADAB ADA bench.
    - b. Westin Hotel Keynote 14:WB Manufacturing PLB Series bench, 20-inch butcher-block seat with stainless-steel pedestal and ADA backrest frame, 42-inch length; fasten to floor.
- H. Baby Changing Station
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Koala Kare Products.

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- b. Foundations Worldwide, Inc.
  - c. ASI–American Specialties, Inc.
2. Type: Countertop-mounted, recessed baby-changing station.
3. Materials/Construction:
  - a. Bed: Manufacturer’s standard high-density polyethylene with smooth, cleanable surface.
  - b. Trim/Mechanism: Manufacturer’s standard corrosion-resistant hardware; concealed hinges.
4. Features:
  - a. Integral safety strap with tamper-resistant buckle.
  - b. Labels and instructions as furnished by manufacturer.
5. Capacity: Provide unit with static load capacity not less than 200 lb (90 kg).
6. Size and Installation: As indicated on Drawings; coordinate cutout and support with casework.
7. Basis of Design product: Subject to compliance with requirements, provide Koala Kare Model KB112-01RE, or approved equal.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
  1. Remove temporary labels and protective coatings.
- B. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
- C.
- D. Shower Seats: Install to comply with specified structural-performance requirements.

#### **3.02 ADJUSTING AND CLEANING**

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces according to manufacturer's written instructions.

**END OF SECTION 102800**



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## **SECTION 123600**

### **COUNTERTOPS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Countertops
  - 1. Solid surfacing countertops.
  - 2. Natural Quartz and Resin Composite Countertops.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 06 4100 Architectural Wood Casework.
- B. Section 10 2800 Toilet, Bath, and Laundry Accessories

##### **1.03 REFERENCE STANDARDS**

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- D. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F. AWI (QCP) - Quality Certification Program; Current Edition.
- G. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- H. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- I. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- J. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.
- K. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- L. NSF 51 - Food Equipment Materials; 2023.
- M. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.
- N. PS 1 - Structural Plywood; 2023.
- O. SEFA 2 - Installations; 2010.

- P. SEFA 3 - Laboratory Work Surfaces; 2020.
- Q. WI (CCP) - Certified Compliance Program (CCP); Current Edition.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination
  - 1. Coordinate sizing and configuration of countertops with associated casework and adjacent construction.
  - 2. Coordinate sizing and locations of cutouts for plumbing fixtures with base cabinet configurations for proper alignments as indicated on Drawings.
  - 3. Verify existing countertop materials and finishes where matching is indicated, and coordinate new work to achieve a consistent appearance. Contractor shall field-confirm existing conditions prior to fabrication.
  - 4. Colors, patterns, and finishes not otherwise indicated shall be selected by Owner from manufacturer's full range, subject to compliance with requirements specified.

#### **1.05 SUBMITTALS**

- A. See Section 013300 - Submittal Procedures for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
  - 1. Indicate plans, sections, dimensions, component sizes, edge details, thermosetting requirements, fabrication details, attachment provisions, sizes of furring, blocking, including concealed blocking and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for items installed in countertops. Show seaming locations.
- D. Selection Samples: Where colors and finishes are not specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Samples for Verification: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

- G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- H. Installation Instructions: Manufacturer's installation instructions and recommendations.
- I. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

#### **1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than five years of documented experience.
- B. Quality Certification:
  - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: [www.awiqcp.org/#sle](http://www.awiqcp.org/#sle).
  - 2. Comply with WI (CCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section:  
[www.woodworkinstitute.com/#sle](http://www.woodworkinstitute.com/#sle).
  - 3. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
  - 4. Provide designated labels on shop drawings as required by certification program.
  - 5. Provide designated labels on installed products as required by certification program.
  - 6. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

#### **1.08 FIELD CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## **PART 2 PRODUCTS**

### **2.01 COUNTERTOPS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
  - 1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum or match existing where indicated.
  - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
    - a. Manufacturers: Subject to compliance with requirements of this Section, and subject to approval by Owner, where matching existing countertops is not indicated, provide products from one of the following manufacturers.
      - 1) Avonite Surfaces: [www.avonitesurfaces.com/#sle](http://www.avonitesurfaces.com/#sle).
      - 2) Dupont: [www.corian.com/#sle](http://www.corian.com/#sle).
      - 3) Durat: <https://www.durat.com>
      - 4) Formica Corporation: [www.formica.com/#sle](http://www.formica.com/#sle).
      - 5) LG Hausys America, Inc: [www.lghausysusa.com/#sle](http://www.lghausysusa.com/#sle).
      - 6) Meganite, Inc: [www.meganite.com/#sle](http://www.meganite.com/#sle).
      - 7) Relang International, LLC: [www.duraseinusa.com/#sle](http://www.duraseinusa.com/#sle).
      - 8) Wilsonart: [www.wilsonart.com/#sle](http://www.wilsonart.com/#sle).
      - 9) Meganite, Inc: [www.meganite.com](http://www.meganite.com)
    - b. Finish and Color:
      - 1) Where indicated, provide countertops to match existing.
      - 2) Where matching is not required, color and finish shall be selected by the Owner from the manufacturer's full standard range, subject to compliance with all requirements of this Section.
  - 3. Other Components Thickness: 1/2 inch (12 mm), minimum.
  - 4. Back and End Splashes: Same sheet material, square top; height as indicated on the Drawings or to match existing conditions.

5. Fabricate in accordance with manufacturer's standard requirements.
- C. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
  1. Flat Sheet Thickness: 1-1/4 inch (32 mm), minimum or match existing where indicated.
  2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.
    - a. Manufacturers: Subject to compliance with requirements of this Section, and subject to approval by Owner, where matching existing countertops is not indicated, provide products from one of the following manufacturers.
      - 1) Cambria Company LLC; Quartz: [www.cambriausa.com/#sle](http://www.cambriausa.com/#sle).
      - 2) Caesarstone; Quartz: [www.caesarstoneus.com](http://www.caesarstoneus.com)
      - 3) Dal-Tile Corporation; ONE Quartz Surfaces: [www.daltile.com/#sle](http://www.daltile.com/#sle).
      - 4) LG Hausys America, Inc; Viatera 3cm: [www.lghausysusa.com/#sle](http://www.lghausysusa.com/#sle).
      - 5) Seieffe Corporation; OKITE®: [www.okite.us/#sle](http://www.okite.us/#sle).
      - 6) Terrazzo & Marble Supply Companies; DIFINITI Quartz: [www.tmsupply.com/#sle](http://www.tmsupply.com/#sle).
      - 7) Wilsonart; Quartz: [www.wilsonart.com/#sle](http://www.wilsonart.com/#sle).
    - b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).
    - c. Finish and Color:
      - 1) Where indicated, provide countertops to match existing.
      - 2) Where matching is not required, color and finish shall be selected by the Owner from the manufacturer's full standard range, subject to compliance with all requirements of this Section.
  3. Other Components Thickness: 3/4 inch (19 mm), minimum.
  4. Back and End Splashes: Same sheet material, square top; height as indicated on the Drawings or to match existing conditions.

## 2.02 MATERIALS

- A. Extruded Aluminum: ASTM B211/B211M, 6463 alloy, T5 temper.

- B. Wood-Based Components:
  - 1. Wood fabricated from old growth timber is not permitted.
- C. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
- D. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
- E. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- F. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- G. Joint Sealant: Mildew-resistant silicone sealant, clear.
- H. Sealer: Stain and acid protection for natural stone counters.
  - 1. NSF approved for food contact per NSF 51.
  - 2. Products:
    - a. Custom Building Products: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
    - b. Rockstar Sealing, a division of TuffSkin Surface Protection LLC; Natural Finish Stone Sealer: [www.rockstarsealing.com/#sle](http://www.rockstarsealing.com/#sle).
    - c. STONETECH, a division of LATICRETE International, Inc: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
    - d. Substitutions: See Section 016000 - Product Requirements.

### **2.03 FABRICATION**

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
  - 1. Join lengths of tops using best method recommended by manufacturer.
  - 2. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
  - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
  - 2. Height: As indicated on the Drawings or to match existing conditions
- C. Solid Surfacing: Fabricate tops up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

1. Arrange seams symmetrically or in orderly locations, minimum 12 inches from edges of sink and similar cutouts.
2. Reinforce as required

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.
- D. Verify actual site dimensions and location of adjacent materials prior to commencing work.
- E. Examine cabinets or other millwork upon which counter tops are to be installed. Verify they are level to within 1/8" in 10' - 0".

#### **3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

#### **3.03 INSTALLATION**

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Apply sealer products in accordance with manufacturer's written instructions.
- C. Seal joint between back/end splashes and vertical surfaces.

#### **3.04 TOLERANCES**

- A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.
- B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.
- C. Field Joints: 1/8 inch (3 mm) wide, maximum.

#### **3.05 CLEANING**

- A. Clean countertops in accordance with manufacturer's instructions
- B. Remove adhesives, sealants, and other stains in accordance with manufacturer's instructions.

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### **3.06 PROTECTION**

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

**END OF SECTION 123600**

## SECTION 129300

### SERVICE ANIMAL RELIEF AREA FURNISHINGS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Synthetic turf system, including drainage grid and perimeter nailer boards.
- B. Interlocking drainage mat system adjacent to synthetic turf area.
- C. Floor transition between synthetic turf and drainage mat.
- D. Wall-mounted stainless steel kennel bowl assembly.
- E. Dog training visual aid (plastic resin fire hydrant).

##### 1.02 REFERENCE STANDARDS

- A. ASTM D5823 – Standard Test Method for Determining Pile Height of Turf.
- B. ASTM D5848 – Standard Test Method for Determining Mass Per Unit Area of Turf.
- C. ASTM D1577 – Standard Test Method for Linear Density (Denier) of Fibers.
- D. ASTM D575 – Standard Test Methods for Rubber Properties in Compression.
- E. ASTM F1677 – Standard Test Method for Using a Portable Inclined Plane Tester (Slip Resistance).
- F. ADA Standards for Accessible Design – Applicable provisions for accessible routes and floor transitions.

##### 1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each type of product specified, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, and safety limitations.
- C. Samples: Provide following prior to ordering material:
  - 1. Synthetic Turf: Minimum 12-inch by 12-inch sample showing full face yarn and backing construction.
  - 2. Drainage Grid Panel: Full-size panel, 32 inches by 32 inches (nominal), or manufacturer's standard sample size.
  - 3. Interlocking Drainage Mat: Minimum 12-inch by 12-inch sample showing interlocking edges and surface pattern.

D. Manufacturer's Qualification Statement.

E. Maintenance Data:

1. For manufactured surfacing products, provide manufacturer's recommended maintenance instructions and list of repair products, with address and phone number of source of supply.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, handle, and store synthetic grass surfacing to project site in accordance with manufacturer's recommendations.
- B. Store materials in dry, covered area, elevated above grade.

### **PART 2 PRODUCTS**

#### **2.01 SYNTHETIC TURF**

- A. Synthetic Turf: Complete synthetic grass surfacing system designed for pet relief areas, consisting of antimicrobial synthetic yarns bonded to a permeable backing suitable for indoor installation.
- B. Basis of Design Product: ForeverLawn K9Grass® Classic+; subject to compliance with requirements of this Section and approval by Owner, or approved equal.
- C. Performance and Construction Requirements:
  1. Face Yarn:
    - a. Material:
      - 1) Primary: Polyethylene monofilament.
      - 2) Secondary: Heat-set textured nylon monofilament with integrated antimicrobial agent.
    - b. Color:
      - 1) Primary: Summer Green.
      - 2) Secondary: Turf Green.
    - c. Yarn Count:
      - 1) Primary: 5,000/4
      - 2) Secondary: 4,200/8.
  2. Pile Height: 7/8 inch ( $\pm 1/8$  inch), measured in accordance with ASTM D5823.
  3. Face Weight: Minimum 65 oz./sq. yd., measured in accordance with ASTM D5848.

4. Construction: Knitted, non-infill system designed for indoor pet relief applications with flow-through backing for rapid liquid drainage.
5. Backing:
  - a. Type: Flow-through knitted backing to support drainage.
  - b. Integrated antimicrobial protection to resist bacteria and odor buildup.
6. Total Weight: Minimum 70 oz./sq. yd.
7. Seaming: Secure seams with manufacturer-approved adhesive; stitched seams alone shall not be acceptable.
8. Performance Requirements:
  - a. Resistant to urine, moisture, and common cleaning/disinfecting chemicals.
  - b. Designed for frequent cleaning and high-traffic public facilities.
  - c. No loose infill material permitted.

## **2.02 DRAINAGE GRID**

- A. Drainage Grid: Provide a sub-surface drainage support system designed for indoor pet relief applications to promote rapid drainage, maintain a level surface, and support the synthetic turf.
  1. Basis of Design Product: AirField Systems AirDrain™; subject to compliance with requirements of this Section and approval by Owner, or approved equal.
  2. Performance and Construction Requirements:
    - a. Panel Size: 32 inches x 32 inches x 1 inch (nominal).
    - b. Weight: 3.1 lb/panel.
    - c. Compressive Strength: Minimum 233 psi.
    - d. Material: 100 percent recycled copolymer with impact modifier, incorporating “no-break” polymer material.
    - e. Color: Black with carbon black additive for durability.
    - f. Configuration: Open-grid, elevated panel structure to allow vertical and horizontal drainage beneath synthetic turf.
    - g. Installation: Panels interlock to form continuous drainage surface over prepared subbase.
  3. Environmental and Durability Requirements:
    - a. Resistant to moisture, cleaning chemicals, and microbial growth.

- b. Suitable for use over concrete, asphalt, sealed rooftop, or compacted aggregate subbase.

### **2.03 PERIMETER NAILER BOARD**

- A. Perimeter Nailer Board: Provide perimeter attachment to secure synthetic turf and drainage panels in place.
- B. Material Requirements:
  - 1. Solid plastic/polymer composite.
  - 2. Moisture-proof, rot-proof, insect-resistant, and resistant to chemicals and cleaning agents typically used in animal facilities.
  - 3. Capable of maintaining structural integrity in indoor environments.
  - 4. Dimensions: As required for the system. Provide longest practical lengths to minimize joints; accommodate curved installation where shown.
- C. Performance Requirements:
  - 1. Provide secure edge restraint for synthetic turf and drainage panels under heavy foot traffic and repeated cleaning.
  - 2. Maintain fastener retention equal to or greater than preservative-treated lumber.
  - 3. Meet applicable sustainability requirements for recycled content, if required by project.

### **2.04 INTERLOCKING DRAINAGE MAT**

- A. Interlocking Drainage Mat: Provide modular interlocking floor tile system for use in high-traffic animal relief areas adjacent to turf installation.
- B. Basis of Design Product: Wearwell ErgoDeck® General Purpose Open; subject to compliance with requirements of this Section and approval by Owner, or approved equal.
- C. Material Requirements:
  - 1. Constructed of silicone-free PVC.
  - 2. Resistant to moisture, cleaning chemicals, and common hydrocarbons found in indoor service environments.
- D. Dimensions and Configuration:
  - 1. Tile Size: 18 inches x 18 inches (nominal).
  - 2. Thickness: 7/8 inch (22 mm).
  - 3. Interlocking System: Positive connection system to prevent separation under use; tiles shall be replaceable individually without removing the entire mat.

4. Color: Black or Charcoal, as selected by Owner.

E. Performance Requirements:

1. Provide a stable, slip-resistant walking surface; coefficient of friction minimum 0.65 dry, 0.42 wet, per ASTM F1677.
2. Provide cushioning and anti-fatigue properties suitable for extended standing and animal use.
3. Compressive Strength: Minimum 61 psi at 15% deflection, per ASTM D575.
4. Fire Resistance: MVSS 302, Class "A" rating.

## 2.05 FLOOR TRANSITION

A. Floor Transition: Provide threshold transition between synthetic turf system and interlocking drainage mat.

1. Material: Extruded aluminum, corrosion-resistant, suitable for high-traffic public facilities.
2. Profile: Low-profile threshold transition, maximum 1/2 inch (13 mm) height above finished floors.
3. Configuration:
  - a. Tapered edges to provide smooth transition and eliminate trip hazards.
  - b. Width and shape as required to fully cover joint between flooring systems and as indicated on the Drawings.
4. Finish: Clear anodized.
5. Performance Requirements:
  - a. Comply with ADA Standards for accessible routes, including maximum height and bevel requirements.
  - b. Securely anchored to prevent movement under pedestrian and animal traffic.
  - c. Resistant to cleaning chemicals and moisture in animal relief areas.

## 2.06 STAINLESS STEEL KENNEL BOWL

- A. Stainless Steel Kennel Bowl Assembly: Provide wall-mounted animal water bowl assembly for service animal relief area.
- B. Basis of Design Product: Lucky Dog Kennel Bowl System; subject to compliance with requirements of this Section and approval by Owner, or approved equal.
- C. Material Requirements:
  1. Bowl and clamp fabricated from Type 304 stainless steel, minimum 18-gauge thickness.

2. Removable bowl with quick-release clamp for ease of cleaning and refilling.
  3. Mounting bracket and hardware of stainless steel or other corrosion-resistant materials.
- D. Performance Requirements:
1. Secure, drill and set epoxy anchors into existing wall construction; tighten per manufacturer's recommendations.
  2. Capable of supporting bowl when filled without deflection or loosening under normal use.
  3. Resistant to corrosion, repeated removal/installation, and cleaning chemicals.

## **2.07 DOG TRAINING VISUAL AID**

- A. Dog Training Visual Aid: Provide free-standing dog training fixture for installation over synthetic turf surface. Plastic resin molded fire hydrant; subject to compliance with requirements of this Section and approval by Owner, or approved equal.
- B. Material Requirements:
1. Molded high-density plastic resin, UV-stable and impact-resistant.
  2. Color-integral material; fade-resistant.
  3. Non-porous surface to resist moisture absorption and facilitate cleaning.
- C. Dimensions:
1. Minimum overall height: 14 inches (356 mm) above finished turf surface.
  2. Base diameter and weight sufficient to remain stable in service, or provide concealed anchoring as recommended by manufacturer.
- D. Performance Requirements:
1. Designed for indoor use in high-traffic animal relief areas.
  2. Capable of withstanding repeated impacts without cracking or tipping.
  3. Resistant to urine, cleaning chemicals, and weathering.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrates are clean, dry, level, and properly prepared to receive work of this Section.
- B. Confirm locations of water access, floor drains, and wall conditions with Drawings and Owner prior to installation.
- C. Do not begin installation until unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Coordinate with other trades to ensure completion of substrate work, including plumbing and electrical connections, prior to installation.
- B. Protect adjacent finishes and surfaces from damage during installation.

### **3.03 INSTALLATION – GENERAL**

- A. A. Install products in strict accordance with manufacturer's written instructions and approved shop drawings.
- B. Provide a complete, secure, and properly functioning system, with all components accurately located and integrated.
- C. Ensure all work is free of defects, properly aligned, and flush with adjacent finishes.

### **3.04 SYNTHETIC TURF SYSTEM**

- A. Install drainage grid panels over prepared substrate, interlocked to form a continuous surface without gaps or unevenness.
- B. Secure perimeter nailer boards, set flush with finished turf height, mechanically anchored to substrate.
- C. Install synthetic turf over drainage grid, adhered at seams and perimeter using manufacturer-approved adhesives.
- D. Trim edges neatly and secure to perimeter nailer boards.
- E. Ensure smooth, wrinkle-free surface, properly tensioned, and sloped to drain.

### **3.05 INTERLOCKING DRAINAGE MAT**

- A. Lay interlocking drainage tiles tightly together, ensuring secure positive connection of each tile.
- B. Trim edges at perimeter for a neat, flush fit with adjacent finishes and transition strips.
- C. Provide straight, aligned seams; replace any tiles damaged during installation.

### **3.06 FLOOR TRANSITION**

- A. Install aluminum transition strip between synthetic turf and interlocking drainage mat.
- B. Set flush with adjacent surfaces and anchor securely to prevent movement.
- C. Comply with ADA slope and height requirements.

### **3.07 STAINLESS STEEL KENNEL BOWL**

- A. Install mounting bracket to existing wall using drilled epoxy anchors per manufacturer's recommendations.

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- B. Mount removable bowl securely to bracket; verify proper operation and ease of removal/replacement.
- C. Coordinate final installation height and location with Owner.

**3.08 DOG TRAINING VISUAL AID**

- A. Install plastic resin fire hydrant at locations indicated, anchored as recommended by manufacturer.
- B. Ensure installation does not compromise synthetic turf integrity or drainage performance.

**3.09 CLEANING AND PROTECTION**

- A. Clean all new work upon completion; remove adhesives, debris, and foreign materials from surfaces.
- B. Protect completed installations from damage until Substantial Completion.
- C. Provide Owner with maintenance instructions for all products.

**END OF SECTION 129300**

## SECTION 22 05 00 - BASIC PLUMBING REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Requirements applicable to all Division 22 Sections.
- B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

#### 1.2 SCOPE OF WORK

- A. This Specification and the associated drawings govern the furnishing, installing, testing and placing into satisfactory operation the Mechanical Systems.
- B. Each Contractor shall provide all new materials indicated on the drawings and/or in these specifications, and all items required to make the portion of the Mechanical Work a finished and working system.
- C. Separate contracts will be awarded. The division of work is for the contractors' convenience and lists a normal breakdown of the work. Please refer to the Construction Manager's scope statements for complete scope of work description.

#### 1.3 WORK SEQUENCE

- A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours will be required.

#### 1.4 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL & CONTROL CONTRACTORS

- A. Definitions:
  - 1. "Mechanical Contractors" refers to the following:
    - a. Plumbing Contractor.
    - b. Heating Contractor.
    - c. Air Conditioning and Ventilating Contractor.
    - d. Temperature Control Contractor.
    - e. Fire Protection Contractor.
    - f. Testing, Adjusting, and Balancing Contractor.

- B. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractor's responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors and the like. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals reviewed. Therefore, the drawings show only known wiring related to such items. All wiring not shown on the drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall provide complete electrical power/controls wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. All electrical work shall conform to the National Electrical Code. All provisions of the Electrical Specifications concerning wiring, protection, etc., apply to wiring provided by the Mechanical Contractor unless noted otherwise.
4. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Division 22. Materials and installation to conform to Class 1 or 2 requirements.
5. All Contractors shall establish utility elevations prior to fabrication and shall coordinate their material and equipment with other trades. When a conflict arises, priority is as follows:
  - a. Light fixtures.
  - b. Gravity flow piping, including steam and condensate.
  - c. Sheet metal.
  - d. Electrical cable trays, including access space.
  - e. Sprinkler piping and other piping.
  - f. Electrical conduits and wireway.

C. Electrical Contractor's Responsibility:

1. Installs and wires all remote control devices furnished by the Mechanical Contractor or Temperature Control Contractor when so noted on the Drawings.
2. Furnishes, installs and connects all relays, etc., for automatic shutdown of certain fans upon actuation of the Fire Alarm System as indicated and specified in Division 28.
3. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.5 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers are acceptable.
2. All Contractors and subcontractors shall employ only workers skilled in their trades.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the State of Michigan Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all State Codes.
3. Conform to Federal Act S.3874 requiring the reduction of lead in drinking water.
4. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
5. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
6. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
7. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
8. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.

2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.

E. Examination of Drawings:

1. The drawings for the plumbing work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in mechanical documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.
  - a. Any item listed as furnished shall also be installed, unless otherwise noted.
  - b. Any item listed as installed shall also be furnished, unless otherwise noted.

F. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

Referenced Specification Section	Submittal Item
22 05 00	Owner Training Agenda
22 05 29	Hangers and Supports
22 05 53	Plumbing Identification
22 07 16	Plumbing Equipment Insulation
22 07 19	Plumbing Pipe Insulation

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Referenced Specification Section	Submittal Item
22 10 00	Plumbing Piping Systems and Valves
22 10 30	Plumbing Specialties
22 30 00	Plumbing Equipment
22 33 39	Solar Water Heating Systems
22 40 00	Plumbing Fixture

#### 1.6 CHANGE ORDERS

- A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.
- B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.
- C. Change order work shall not proceed until authorized.

#### 1.7 EQUIPMENT SUPPLIERS' INSPECTION

- A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:
  - 1. Fire Seal Systems
  - 2. Seismic Restraints and Equipment Bracing
- B. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

#### 1.8 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

- A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.
- B. Equipment and components that are visibly damaged or have been subject to environmental conditions prior to building turnover to Owner that could shorten the life of the component (for example, water damage, humidity, dust and debris, excessive hot or cold storage location, etc.) shall be repaired or replaced with new equipment or components without additional cost to the building owner.

- C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.
- D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

#### 1.9 WARRANTY

- A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.
- B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.
- C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

#### 1.10 MATERIAL SUBSTITUTION

- A. Where several manufacturers' names are given, the first manufacturer is the basis for job design and establishes the quality.
- B. Equivalent equipment manufactured by the other listed manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections, piping and ductwork connections and arrangement, plumbing connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors.
- C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.
- D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractor's part or on the part of other Contractors whose work is affected.

- E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.
- F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 JOBSITE SAFETY

- A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

### 3.2 ARCHITECT/ENGINEER OBSERVATION OF WORK

- A. The Contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:
  - 1. Covering exterior walls, interior partitions and chases.
  - 2. Installing hard or suspended ceilings and soffits.
- B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.
- C. Above-Ceiling Final Observation
  - 1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:
    - a. Pipe insulation is installed and fully sealed.
    - b. Pipe wall penetrations are sealed.
    - c. Pipe identification and valve tags are installed.

2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

### 3.3 PROJECT CLOSEOUT

#### A. Final Jobsite Observation:

1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

#### B. Before final payment is authorized, this Contractor must submit the following:

1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including marked-up drawings and specifications.
3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
4. Start-up reports on all equipment requiring a factory installation inspection or start-up.
5. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed; receipt by Architect/Engineer required prior to final payment approval.

### 3.4 OPERATION AND MAINTENANCE MANUALS

#### A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copy of final approved test and balance reports.
5. Copies of all factory inspections and/or equipment startup reports.
6. Copies of warranties.
7. Schematic electrical power/controls wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
8. Dimensional drawings of equipment.
9. Capacities and utility consumption of equipment.
10. Detailed parts lists with lists of suppliers.
11. Operating procedures for each system.
12. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
13. Repair procedures for major components.
14. List of lubricants in all equipment and recommended frequency of lubrication.
15. Instruction books, cards, and manuals furnished with the equipment.
16. Owner and Contractor attendance list for domestic water systems operation, maintenance, and flushing training.

3.5 SYSTEM STARTING AND ADJUSTING

- A. The plumbing systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final adjustments as required.
- B. Complete all manufacturer-recommended startup procedures and checklists to verify proper motor rotation, electrical power voltage is within equipment limitations, equipment controls maintain pressures and temperatures within acceptable ranges, all filters and protective guards are in-place, acceptable access is provided for maintenance and servicing, and equipment operation does not pose a danger to personnel or property.
- C. Contractor shall adjust the plumbing systems and controls at season changes during the one year warranty period, as required, to provide satisfactory operation and to prove performance of all systems in all seasons.

- D. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.
- E. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

### 3.6 RECORD DOCUMENTS

- A. Maintain at the job site a separate and complete set of plumbing drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.
- B. Mark drawings to indicate revisions to piping size and location, both exterior and interior; including locations devices, requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located; Change Orders; concealed control system devices.
- C. Before completion of the project, a set of reproducible plumbing drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.
- D. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.
- E. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.
- F. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

### 3.7 PAINTING

- A. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.

- B. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor.
- C. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.
- D. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.

### 3.8 ADJUST AND CLEAN

- A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.
- B. Clean all areas where moisture is present. Immediately report any mold, biological growth, or water damage.
- C. Remove all rust, scale, dirt, oils, stickers and thoroughly clean exterior of all exposed piping, hangers, and accessories.
- D. Remove all rubbish, debris, etc., accumulated during construction from the premises.

### 3.9 SPECIAL REQUIREMENTS

- A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators, etc., with other trades to maintain clear access area for servicing.
- B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.
- C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.

### 3.10 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

- A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:

1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:
  - a. Minimizing the amount of dust generated.
  - b. Reducing solvent fumes and VOC emissions.
  - c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
  - d. Protect stored on-site and installed absorptive materials from moisture damage.
2. Request that the Owner designate an IAQ representative.
3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
6. Request copies of and follow all of the Owner's IAQ and infection control policies.
7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".

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READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to requesting a final job observation.

1. Penetrations fire sealed and labeled in accordance with specifications.
2. All pumps operating and balanced.
3. All plumbing fixtures installed and caulked.
4. Pipe insulation complete, pipes labeled and valves tagged.
5. Owner and Contractor attendance list for domestic water systems operation, maintenance, and flushing training.

Accepted by:

Prime Contractor \_\_\_\_\_

By \_\_\_\_\_ Date \_\_\_\_\_

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION



## SECTION 22 05 03 - THROUGH PENETRATION FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Through-Penetration Firestopping.

#### 1.2 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.
- B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

#### 1.3 REFERENCES

- A. UL 263 - Fire Tests of Building Construction and Materials
- B. UL 723 - Surface Burning Characteristics of Building Materials
- C. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops
- D. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)
- E. Intertek / Warnock Hersey - Directory of Listed Products
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- G. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops
- H. 2021 International Building Code
- I. NFPA 5000 - Building Construction Safety Code

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.
- B. Install material prior to expiration of product shelf life.

## 1.5 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
  - 1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.
  - 2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
  - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
  - 2. L-Rated Systems: Provide through-penetration firestop systems with L-ratings of not more than 5.0 CFM/sq. ft at both ambient temperature and 400F or smoke barriers.
- C. For through-penetration firestop systems exposed to light, traffic, moisture, or physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. For through-penetration firestop systems in air plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

## 1.6 WARRANTY

- A. Provide one year warranty on parts and labor.
- B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, general durability, or appear to deteriorate in any manner not clearly specified by the manufacturer as an inherent quality of the material.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers. All firestopping systems installed shall be provided by a single manufacturer.
1. 3M; Fire Protection Products Division.
  2. Hilti, Inc.
  3. RectorSeal Corporation, Metacaulk.
  4. Tremco; Sealant/Weatherproofing Division.
  5. Johns-Manville.
  6. Specified Technologies Inc. (S.T.I.)
  7. Spec Seal Firestop Products
  8. AD Firebarrier Protection Systems
  9. Dow Corning Corp.
  10. Fire Trak Corp.
  11. International Protective Coating Corp.
  12. HoldRite

### 2.2 THROUGH PENETRATION FIRESTOP SYSTEMS

- A. Provide materials and systems classified by or listed by Intertek / Warnock Hersey to provide firestopping equal to time rating of construction being penetrated.
- B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that would require hazardous waste removal.
- C. Firestopping shall be flexible to allow for normal penetrating item movement due to expansion and contraction.
- D. Firestopping systems for plumbing and wet pipe sprinkler piping shall be moisture resistant.
- E. Provide firestopping systems capable of supporting floor loads where systems are exposed to possible floor loading or traffic.
- F. Provide firestopping systems allowing continuous insulation for all insulated pipes.
- G. Provide firestopping systems classified by UL or listed by Intertek / Warnock Hersey for penetrations through all fire rated construction. Firestopping systems shall be selected from the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory Category XHEZ based on substrate construction and penetrating item size and material and shall fall within the range of numbers listed:
1. Combustible Framed Floors and Chase Walls - 1 or 2 Hour Rated:

- a. F Rating = Floor/Wall Rating
- b. L Rating = Penetrations in Smoke Barriers

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	FC 0000-0999*
Metallic Pipe or Conduit	FC 1000-1999
Non-Metallic Pipe or Conduit	FC 2000-2999
Electrical Cables	FC 3000-3999
Cable Trays	FC 4000-4999
Insulated Pipes	FC 5000-5999
Bus Duct and Misc. Electrical	FC 6000-6999
Duct without Damper and Misc. Mechanical	FC 7000-7999
Multiple Penetrations	FC 8000-8999

\*Alternate method of firestopping is patching opening to match original rated construction.

2. Non-Combustible Framed Walls - 1 or 2 Hour Rated:

- a. F Rating = Floor/Wall Rating
- b. L Rating = Penetrations in Smoke Barriers

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL 6000-6999
Duct without Damper and Misc. Mechanical	WL 7000-7999
Multiple Penetrations	WL 8000-8999

\*Alternate method of firestopping is patching opening to match original rated construction.

3. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated:

- a. F Rating = Wall/Floor Rating
- b. L Rating = Penetrations in Smoke Barriers

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999

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<u>Penetrating Item</u>	<u>UL System No.</u>
Cable Trays	CAJ 4000-4999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ 6000-6999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999

\*Alternate method of firestopping is patching opening to match original rated construction.

- H. Any opening in walls or floors not covered by the listed series of numbers shall be coordinated with the firestopping manufacturer.
- I. Any openings in floors or walls not described in the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having Jurisdiction.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose materials. Clean and repair surfaces as required. Remove laitance and form-release agents from concrete.
- B. Ensure substrate and penetrating items have been permanently installed prior to installing firestopping systems. Ensure penetrating items have been properly spaced and have proper clearance prior to installing firestopping systems.
- C. Surfaces to which sealing materials are to be installed must meet the selected UL or Intertek / Warnock Hersey system substrate criteria.
- D. Prime substrates where recommended in writing by through-penetration firestop system manufacturer. Confine primer to area of bond.

#### 3.2 INSTALLATION

- A. In existing construction, provide firestopping of openings prior to and after installation of penetrating items. Remove any existing coatings on surfaces prior to firestopping installation. Temporary firestopping shall consist of packing openings with fire resistant mineral wool for the full thickness of substrate, or an alternate method approved by the Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately upon their installation and shall remain so until the permanent UL or listed by Intertek / Warnock Hersey listed firestopping system is installed.

- B. Install penetration seal materials in accordance with printed instructions of the UL or Intertek / Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application instructions.
- C. Install dams as required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Remove combustible damming after appropriate curing.

### 3.3 CLEANING AND PROTECTING

- A. Clean excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not cause damage.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

### 3.4 INSPECTION

- A. All penetrations shall be inspected by the manufacturer's representative to ensure proper installation.
- B. Access to firestop systems shall be maintained for examination by the Authority Having Jurisdiction at their request.
- C. Proceed with enclosing through-penetration firestop system with other construction only after inspection reports are issued and firestop installations comply with requirements.

END OF SECTION

## SECTION 22 05 05 - PLUMBING DEMOLITION FOR REMODELING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Mechanical Demolition.
- B. Cutting and Patching.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be as specified in individual Sections.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. THE DRAWINGS ARE INTENDED TO INDICATE THE GENERAL SCOPE OF WORK AND DO NOT SHOW EVERY PIPE, DUCT, OR PIECE OF EQUIPMENT THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY CONDITIONS PRIOR TO SUBMITTING A BID.
- B. Where walls, ceilings, etc., are shown as being removed on general drawings, the Contractor shall remove all mechanical equipment, devices, fixtures, piping, ducts, systems, etc., from the removed area.
- C. Where ceilings, walls, partitions, etc., are temporarily removed and replaced by others, This Contractor shall remove, store, and replace equipment, devices, fixtures, pipes, ducts, systems, etc.
- D. Verify that abandoned utilities serve only abandoned equipment or facilities. Extend services to facilities or equipment that shall remain in operation following demolition.
- E. Coordinate work with all other Contractors and the Owner. Schedule removal of equipment to avoid conflicts.
- F. This Contractor shall verify all existing equipment sizes and capacities where equipment is scheduled to be replaced or modified, prior to ordering new equipment.
- G. Bid submittal shall mean the Contractor has visited the project site and verified existing conditions and scope of work.

### 3.2 PREPARATION

- A. Disconnect plumbing systems in walls, floors, and ceilings scheduled for removal.
- B. Provide temporary connections to maintain existing systems in service during construction. When work must be performed on operating equipment, use personnel experienced in such operations.
- C. Existing Plumbing System: Maintain service to all plumbing fixtures until new piping is installed. Obtain permission from Owner at least 48 hours before shutting down system for any reason. Make changeover to new piping with minimum outage. Do not disconnect any roof drainage piping until new piping is in place and operational.

### 3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned piping to source of supply and/or main lines.
- C. Remove exposed abandoned pipes, including abandoned pipes above accessible ceilings. Cut pipes above ceilings, below floors and behind walls. Cap remaining lines. Repair building construction to match original. Remove all clamps, hangers, supports, etc. associated with pipe and duct removal.
- D. Disconnect and remove mechanical devices and equipment serving equipment that has been removed.
- E. Repair adjacent construction and finishes damaged during demolition and extension work.
- F. Extend existing installations using materials and methods compatible with existing installations, or as specified.
- G. Remove unused sections of domestic water piping back to active mains and cap. Capped pipe length shall be less than 1.5 times the capped pipe diameter to prevent "dead legs".
- H. Temporarily cap all openings to the sanitary and vent system to prevent odor from entering the work area and building.

### 3.4 CUTTING AND PATCHING

- A. This Contractor is responsible for all penetrations of existing construction required to complete the work of this project.
- B. Penetrations in existing construction should be reviewed carefully prior to proceeding with any work.

- C. Penetrations shall be neat and clean with smooth and/or finished edges. Core drill where possible for clean opening.
- D. Repair existing construction as required after penetration is complete to restore to original condition. Use similar materials and match adjacent construction unless otherwise noted or agreed to by the Architect/Engineer prior to start of work.
- E. Floor slabs may contain conduit systems. This Contractor is responsible for taking any measures required to ensure no conduits or other services are damaged. This includes X-ray or similar non-destructive means.
- F. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

### 3.5 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Clean all systems adjacent to project which are affected by the dust and debris caused by this construction.
- C. PLUMBING ITEMS REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.

### 3.6 SPECIAL REQUIREMENTS

- A. Review locations of all new penetrations in existing floor slabs or walls. Determine construction type and review for possible interferences. Bring all concerns to the attention of the Architect/Engineer before proceeding.

END OF SECTION



## SECTION 22 05 29 - PLUMBING SUPPORTS AND ANCHORS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Hangers, Supports, and Associated Anchors.
- B. Equipment Bases and Supports.
- C. Sleeves and Seals.
- D. Flashing and Sealing of Equipment and Pipe Stacks.
- E. Cutting of Openings.
- F. Escutcheon Plates and Trim.

#### 1.2 REFERENCES

- A. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.
- B. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
- C. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices
- D. MSS SP-127 - Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

#### 1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 22 05 00. Include plastic pipe manufacturers' support spacing requirements.

#### 1.4 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

### PART 2 - PRODUCTS

#### 2.1 HANGER RODS

- A. Hanger rods for single rod hangers shall conform to the following:
  - 1. Steel, Cast Iron, and Glass Pipe:

- a. Hanger Rod Diameter:
  - 1) 2" and smaller: 3/8"
  - 2) 2-1/2" through 3-5/8": 1/2"
  - 3) 4" through 6": 1/2"
  - 4) 8": 5/8"
  - 5) 10": 3/4"
  - 6) 12": 7/8"
  - 7) 14" and 16": 1"
  - 8) 18" and 24": 1-1/4"

2. Copper and Plastic Pipe:

- a. Hanger Rod Diameter:
  - 1) 2" and smaller: 3/8"
  - 2) 2-1/2") through 3-5/8": 1/2"
  - 3) 4") through 6": 1/2"
  - 4) 8": 5/8"
  - 5) 10": 3/4"
  - 6) 12": 7/8"
  - 7) 14" and 16": 1"
  - 8) 18" and 24": 1-1/4"

- B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8 inches.
- C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.
- D. All hanger rods, nuts, washers, clevises, etc., in damp areas shall have ASTM A123 hot-dip galvanized finish applied after fabrication. This applies to the following areas:

2.2 PIPE AND STRUCTURAL SUPPORTS

A. General:

1. Pipe hangers, clamps, and supports shall conform to Manufacturers Standardization Society MSS SP-58, 69, 89, and 127 (where applicable).
2. On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. Refer to insulation specifications for materials and additional information.

3. Copper piping located in an exposed area, including indirect waste piping, shall use split ring standoff hangers for copper tubing. Support shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, nVent Cushion Clamp or Eaton Vibra-Clamp. Use electro-galvanized or more corrosion resistant and threaded rod for floor applications. Use anchors applicable to the wall type with corrosion resistant threaded rod for wall applications.

a. Products:

- 1) nVent/M-Co Model #456
- 2) Eaton Fig. 3198HCT
- 3) Anvil Fig. CT138R

B. Vertical Supports:

1. Support and laterally brace vertical pipes at every floor level in multi-story structures, unless otherwise noted by applicable codes, but never at intervals over 15 feet. Support vertical pipes with riser clamps installed below hubs, couplings, or lugs. Provide sufficient flexibility to accommodate expansion and contraction to avoid compromising fire barrier penetrations or stressing piping at fixed takeoff locations.

a. Products:

- 1) Eaton Fig B3373 Series
- 2) nVent 510 Series
- 3) Anvil Fig. 90

2. Cold Pipe: Place restrained neoprene mounts beneath vertical pipe riser clamps to prevent sweating of cold pipes. Select neoprene mounts based on the weight of the pipe to be supported. Insulate over mounts.

a. Products:

- 1) Mason RBA, RCA or RDA
- 2) Mason BR

3. Cold Pipe Alternative: Insulated pipe riser clamp with no thermal bridging between clamp and pipe; water repellent calcium silicate insulation material adhered inside the clamp; ASTM A653 galvanized steel clamp.

a. Products:

- 1) Pipeshields, Inc E1000, E1100, E1200, or E1300 (manufacturer to confirm based on pipe diameter and weight when in service)

4. Wall supports shall be used where vertical height of structure exceeds minimum spacing requirements. Install wall supports at same spacing as hangers or strut supports along vertical length of pipe runs. Wall supports shall be coordinated with the Structural Engineer.
5. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.

C. Hangers and Clamps:

1. Oversize all hangers, clamps, and supports on insulated piping to allow insulation and jacket to pass through unbroken. This applies to both hot and cold pipes.
2. Hangers in direct contact with bare copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, nVent Cushion Clamp or Eaton Vibra-Clamp within their temperature limits of -65F to +275F.
3. Vertical cold pipe drops and rough-ins to fixtures shall be supported by insulated pipe clamps to prevent thermal bridging and condensation.
4. On all insulated piping, provide a semi-cylindrical metallic shield and vapor barrier jacket.
5. Unless otherwise indicated, hangers shall be as follows:
  - a. Clevis Type: Bare Metal Pipe, Rigid Plastic Pipe, Insulated Cold Pipe, Insulated Hot Pipe - 3 inches & Smaller
    - 1) Products: Bare Steel Plastic or Insulated Pipe:
      - a) Anvil Fig. 260
      - b) Eaton Fig. 3100
      - c) nVent Model 400
    - 2) Products: Bare Copper Pipe Felt or PVC Coated:
      - a) Eaton Fig. B3104F or B3100CTC
      - b) Anvil Fig. CT65
      - c) nVent Fig. 402
  - b. Continuous Channel with Clevis Type: Service: Plastic Tubing, Flexible Hose, Soft Copper Tubing:
    - 1) Products:
      - a) Eaton Fig. B3106, with Fig. B3106V
      - b) nVent Model 104, with Model 104V
      - c) Anvil Fig. 1V
  - c. Adjustable Swivel Ring Type: Bare Metal Pipe - 4 inches and Smaller

- 1) Products: Bare Steel Pipe:
  - a) Anvil Fig. 69
  - b) Eaton Fig. B3170NF
  - c) nVent Model 115
- 2) Products: Bare Copper Pipe:
  - a) Eaton Fig. B3170CTC
  - b) nVent 102A0 Series
  - c) Anvil Fig. CT-69
6. Support may be fabricated from U-channel strut or similar shapes. Piping less than 4" in diameter shall be secured to strut with clamps of proper design and capacity as required to maintain spacing and alignment. Strut shall be independently supported from hanger drops or building structure. Size and support shall be per manufacturer's installation requirements for structural support of piping. Clamps shall not interrupt piping insulation.
  - a. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.
  - b. Strut used in damp areas listed in hanger rods shall have ASTM A123 hot-dip galvanized finish applied after fabrication.
7. Unless otherwise indicated, pipe supports for use with struts shall be as follows:
  - a. Clamp Type: Bare Metal Pipe, Rigid Plastic Pipe, Insulated Cold Pipe, Insulated Hot Pipe - 3 inches and smaller
    - 1) Clamps in direct contact with copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, nVent Cushion Clamp or Eaton Vibra-Clamp.
    - 2) Pipes subject to expansion and contraction shall have clamps oversized to allow limited pipe movement.
    - 3) Products: Bare Steel, Plastic or Insulated Pipe:
      - a) Unistrut Fig. P1100 or P2500
      - b) Eaton Fig. B2000 or B2400
      - c) Anvil Fig. AS1200
      - d) nVent USC
    - 4) Products: Bare Copper Pipe:
      - a) Eaton Fig. BVT
      - b) nVent CADDY Cushion Clamp

D. Upper (Structural) Attachments:

1. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as follows:
  - a. Steel Structure Clamps: C-Type Wide Flange Beam Clamps (for use on top and/or bottom of wide flanges. Not permitted for use with bar-joists.):
    - 1) Products:
      - a) Anvil Fig. 86
      - b) Eaton Fig. B3033/B3034
      - c) nVent Model 300 & 310
  - b. Steel Structure Clamps: Scissor Type Beam Clamps (for use with bar-joists and wide flange):
    - 1) Products:
      - a) Anvil Fig. 228, 292
      - b) Eaton Fig. B3054
      - c) nVent Model 360
  - c. Concentrically Loaded Open Web Joist Hangers (for use with bar joists):
    - 1) Products:
      - a) MCL. M1, M2 or M3
  - d. Concrete: Concrete Inserts, Single Rod Galvanized:
    - 1) Products:
      - a) Anvil Fig. 282
      - b) Eaton Fig. B3014
      - c) nVent Model 355
  - e. Concrete: Concrete Inserts, Continuous Strip Galvanized:
    - 1) Products:
      - a) Unistrut Corp P3200 Series
      - b) Eaton Fig. B22
      - c) nVent CONB
      - d) Anvil AS249
  - f. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of ACI 318. Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.

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- g. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.
  - h. Wood Anchors: Tension wood rod hanger for suspending 3/8" threaded rod. Zinc plated carbon steel.
    - 1) Minimum allowable tension loads for Douglass Fir/Southern Pine:
      - a) 3/8" diameter rod; 2-1/2" shank: 600 lb/590 lb.
      - b) Load values are based on full shank penetration into wood member. Minimum edge distance 3/4". Minimum end distance 3-1/4".
    - 2) Limitations:
      - a) Truss: Do not hang from wood trusses without truss manufacturer or Structural Engineer's approval.
      - b) Sheetrock/Gypsum Ceiling: When drilling through non-wood materials (e.g., sheet rock, gypsum, etc.), increase shank length by depth of non-wood materials.
      - c) Plywood Flooring/Roofing: Do not hang from plywood floor or roofing.
      - d) Spacing: Refer to wood structure spacing of hangers.
    - 3) Products:
      - a) Simpson RWV
      - b) DeWALT
      - c) ITI Sammys GT25

## 2.3 FOUNDATIONS, BASES, AND SUPPORTS

### A. Basic Requirements:

1. Furnish and install foundations, bases, and supports (not specifically indicated on the Drawings or in the Specifications of either the General Construction or Mechanical work as provided by another Contractor) for mechanical equipment.

### B. Supports:

1. Provide sufficient clips, inserts, hangers, racks, rods, and auxiliary steel to securely support all suspended material, equipment and conduit without sag.
2. Hang heavy equipment from concrete floors or ceilings with Architect/Engineer-approved concrete inserts, furnished and installed by the Contractor whose work requires them, except where indicated otherwise.

### C. Grout:

1. Grout shall be non-shrinking premixed (Master Builders Company "Embecco"), unless otherwise indicated on the drawings or approved by the Architect/Engineer.
2. Use Mix No. 1 for clearances of 1" or less, and Mix No. 2 for all larger clearances.
3. Grout under equipment bases, around pipes, at pipe sleeves, etc., and where shown on the drawings.

#### 2.4 OPENINGS IN FLOORS, WALLS AND CEILINGS

- A. Exact locations of all openings for the installation of materials shall be determined by the Contractor and given to the General Contractor for installation or construction as the structure is built.
- B. Coordinate all openings with other Contractors.
- C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in or through existing structures, or openings in new structures that were not installed, or additional openings. Repair all spalling and damage to the satisfaction of the Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and uniform opening edges.
- D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate openings with other Contractors shall not exempt the Contractor from providing openings at Contractor's expense.
- E. Do not cut structural members without written approval of the Architect or Structural Engineer.
- F. Exposed Housing Penetrations: Seal pipes with surface temperature below 150F, penetrating housings with conical stepped, white silicone, EPDM or neoprene pipe flashings and stainless steel clamps equal to Portals Plus Pipe Boots or Pipetite.

#### 2.5 SLEEVES AND LINTELS

- A. Each Contractor shall provide sleeves and lintels for all duct and pipe openings required for the Contractor's work in masonry walls and floors, unless specifically shown as being by others.
- B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings. Provide continuous sleeve. Cut or split sleeves are not acceptable.
- C. Fabricate all lintels for masonry walls from structural steel shapes or as indicated on the drawings. Have all lintels approved by the Architect or Structural Engineer.
- D. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed squared ends extending 1" above the floor in unfinished areas, and flush with the floor in finished areas, to accept spring closing floor plates.
- E. Sleeves shall not penetrate structural members or masonry walls without approval from the Structural Engineer. Sleeves shall then comply with the Architect/Engineer's design.

- F. Openings through unexcavated floors and/or foundation walls below the floor shall have a smooth finish with sufficient annular space around material passing through opening so slight settling will not place stress on the material or building structure.
- G. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This Contractor is responsible for sleeves dislodged or moved when pouring concrete.
- H. Where pipes rise through concrete floors that are on earthen grade, provide 3/4" resilient expansion joint material (e.g., foam, rubber, asphalt-coated fiber, bituminous-impregnated felt, or cork) wrapped around the pipe, the full depth of concrete, at the point of penetration. Secure to prevent shifting during concrete placement and finishing.
- I. Size sleeves large enough to allow expansion and contraction movement. Provide continuous insulation wrapping.

## 2.6 ESCUTCHEON PLATES AND TRIM

- A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors, or ceilings of finished rooms.
- B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium plated finish, heavy spring clip, rigid hinge and latch.
- C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and raw construction edges of all rectangular openings in finished rooms. This includes pipe openings.

## 2.7 PIPE PENETRATIONS

- A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk. Backing material may be used.
- B. Seal fire rated wall and floor penetrations with fire seal system as specified.

## 2.8 PIPE ANCHORS

- A. Provide all items needed to allow adequate expansion and contraction of all piping. All piping shall be supported, guided, aligned, and anchored as required.
- B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the building.

## 2.9 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

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## PART 3 - EXECUTION

### 3.1 PLUMBING SUPPORTS AND ANCHORS

#### A. General Installation Requirements:

1. Install all items per manufacturer's instructions.
2. Coordinate the location and method of support of piping systems with all installations under other Divisions and Sections of the Specifications.
3. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
4. Supports shall extend directly to building structure. Do not support piping from duct hangers unless coordinated with Sheet Metal Contractor prior to installation. Do not allow lighting or ceiling supports to be hung from piping supports.

#### B. Supports Requirements:

1. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel, etc., which attach to it shall be installed prior to application of fireproofing. Repair all fireproofing damaged during pipe installation.
2. Set all concrete inserts in place before pouring concrete.
3. Furnish, install and prime all auxiliary structural steel for support of piping systems that are not shown on the Drawings as being by others.
4. Install hangers and supports complete with lock nuts, clamps, rods, bolts, couplings, swivels, inserts and required accessories.
5. Hangers for horizontal piping shall have adequate means of vertical adjustment for alignment.

#### C. Pipe Requirements:

1. Support all piping and equipment, including valves, strainers, traps and other specialties and accessories to avoid objectionable or excessive stress, deflection, swaying, sagging or vibration in the piping or building structure during erection, cleaning, testing and normal operation of the systems.
2. Do not, however, restrain piping to cause it to snake or buckle between supports or to prevent proper movement due to expansion and contraction.
3. Support piping at equipment and valves so they can be disconnected and removed without further supporting the piping.
4. Piping shall not introduce strains or distortion to connected equipment.
5. Parallel horizontal pipes may be supported on trapeze hangers made of structural shapes and hanger rods; otherwise, pipes shall be supported with individual hangers.
6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.
7. Provide additional supports where pipe changes direction, adjacent to flanged valves and strainers, at equipment connections and heavy fittings.
8. Provide at least one hanger adjacent to each joint in grooved end steel pipe with mechanical couplings.

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- D. Provided the installation complies with all loading requirements of truss and joist manufacturers, the following practices are acceptable:
1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom chords of trusses or joists with a minimum 3' spacing between loads.
  2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:
    - a. The hanger is attached within 6" from a web/chord joint.
    - b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.
  3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
  4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.
- E. After piping and insulation installation are complete, cut hanger rods back at trapeze supports so they do not extend more than 3/4" below bottom face of lowest fastener and blunt any sharp edges.
- F. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- G. Do not exceed the manufacturer's recommended maximum load for any hanger or support.
- H. Steel/Concrete Structure: Spacing of hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:
1. Steel and Fiberglass (Std. Weight or Heavier - Liquid Service):
    - a. Maximum Spacing:
      - 1) 1-1/4" & under: 7'-0"
      - 2) 1-1/2": 9'-0"
      - 3) 2": 10'-0"
      - 4) 2-1/2": 11'-0"
      - 5) 3": 12'-0"
      - 6) 4" & larger: 12'-0"
  2. Steel (Std. Weight or Heavier - Vapor Service):
    - a. Maximum Spacing:

- 1) 1-1/4" and under: 9'-0"
    - 2) 1-1/2": 12'-0"
    - 3) 2" & larger: 12'-0"
  3. Hard Drawn Copper & Brass (Liquid Service):
    - a. Maximum Spacing:
      - 1) 3/4" and under: 5'-0"
      - 2) 1": 6'-0"
      - 3) 1-1/4": 7'-0"
      - 4) 1-1/2" 8'-0"
      - 5) 2": 8'-0"
      - 6) 2-1/2": 9'-0"
      - 7) 3": 10'-0"
      - 8) 4": 12'-0"
      - 9) 6": 12'-0"
  4. Hard Drawn Copper & Brass (Vapor Service):
    - a. Maximum Spacing:
      - 1) 3/4" & under: 7'-0"
      - 2) 1": 8'-0"
      - 3) 1-1/4": 9'-0"
      - 4) 1-1/2": 10'-0"
      - 5) 2": 11'-0"
      - 6) 2-1/2" & larger: 12'-0"
  5. Plastic Pipe:
    - a. Hangers shall be spaced based on the piping system manufacturer's instructions or, if no system instructions are available, space hangers at 4'-0" maximum centers.
  6. Ultra-Flexible Pipe, and Flexible Hose, and Soft Copper Tubing:
    - a. Continuous channel with hangers maximum 8'-0" OC.
- I. Wood Structure: Spacing of hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:
  1. Steel and Fiberglass (Std. Weight or Heavier - Liquid Service):
    - a. Maximum Spacing:
      - 1) 1-1/4" & under: 7'-0"
      - 2) 1-1/2": 9'-0"

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- 3) 2": 10'-0"
  - 4) 2-1/2": 11'-0"
  - 5) 3": 12'-0"
  - 6) 4" through 6": 12'-0"
  - 7) 8": 9'-0"
  - 8) 10": 6'-0"
  - 9) 12": 4'-0"

2. Steel (Std. Weight or Heavier - Vapor Service):

a. Maximum Spacing:

- 1) 1-1/4" and under: 9'-0"
- 2) 1-1/2": 12'-0"
- 3) 2" & larger: 12'-0"
- 4) 2-1/2": 11'-0"
- 5) 3": 12'-0"
- 6) 4" through 8": 12'-0"
- 7) 10": 9'-0"
- 8) 12": 6'-0"

3. Hard Drawn Copper & Brass (Liquid Service):

a. Maximum Spacing:

- 1) 3/4" and under: 5'-0"
- 2) 1": 6'-0"
- 3) 1-1/4": 7'-0"
- 4) 1-1/2" 8'-0"
- 5) 2": 8'-0"
- 6) 2-1/2": 9'-0"
- 7) 3": 10'-0"
- 8) 4": 12'-0"
- 9) 6": 12'-0"

4. Hard Drawn Copper & Brass (Vapor Service):

a. Maximum Spacing:

- 1) 3/4" & under: 7'-0"
- 2) 1": 8'-0"
- 3) 1-1/4": 9'-0"
- 4) 1-1/2": 10'-0"
- 5) 2": 11'-0"
- 6) 2-1/2" & larger: 12'-0"

5. Plastic Pipe:

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- a. Hangers shall be spaced based on the piping system manufacturer's instructions or, if no system instructions are available, space hangers at 4'-0" maximum centers.
6. Ultra-Flexible Pipe, Flexible Hose, and Soft Copper Tubing:
    - a. Continuous channel with hangers maximum 8'-0" OC.
- J. Wood Structure: Spacing of hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:
1. Steel and Fiberglass (Std. Weight or Heavier - Liquid Service):
    - a. Maximum Spacing:
      - 1) 1-1/4" & under: 7'-0"
      - 2) 1-1/2": 9'-0"
      - 3) 2": 10'-0"
      - 4) 2-1/2": 11'-0"
      - 5) 3": 12'-0"
      - 6) 4" through 6": 12'-0"
      - 7) 8": 9'-0"
      - 8) 10": 6'-0"
      - 9) 12": 4'-0"
  2. Steel (Std. Weight or Heavier - Vapor Service):
    - a. Maximum Spacing:
      - 1) 1/2" and under: 6'-0"
      - 2) 3/4" to 1": 8'-0"
      - 3) 1-1/4" and under: 9'-0"
      - 4) 1-1/2": 10'-0"
      - 5) 2" & larger: 10'-0"
      - 6) 3": 12'-0"
      - 7) 4" through 8": 12'-0"
      - 8) 10": 9'-0"
      - 9) 12": 6'-0"
  3. Hard Drawn Copper & Brass (Liquid Service):
    - a. Maximum Spacing:
      - 1) 3/4" & under: 5'-0"
      - 2) 1": 6'-0"
      - 3) 1-1/4": 6'-0"
      - 4) 1-1/2": 6'-0"
      - 5) 2": 8'-0"

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- 6) 2-1/2": 9'-0"
  - 7) 3": 10'-0"
  - 8) 4": 10'-0"
  - 9) 6": 10'-0"

4. Hard Drawn Copper & Brass (Vapor Service):

a. Maximum Spacing:

- 1) 3/4" & under: 6'-0"
- 2) 1": 6'-0"
- 3) 1-1/4": 6'-0"
- 4) 1-1/2": 6'-0"
- 5) 2": 10'-0"
- 6) 2-1/2" & larger: 10'-0"

5. Plastic Pipe:

- a. Hangers shall be spaced based on the piping system manufacturer's instructions or, if no system instructions are available, space hangers at 4'-0" maximum centers.

6. Ultra-Flexible Pipe, Flexible Hose, and Soft Copper Tubing:

- a. Continuous channel with hangers maximum 8'-0" OC.

K. Installation of hangers shall conform to MSS SP-58, 69, 89 and the applicable Plumbing Code.

END OF SECTION



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## SECTION 22 05 53 - PLUMBING IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Identification of products installed under Division 22.

#### 1.2 REFERENCES

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

#### 1.3 SUBMITTALS

- A. Submit shop drawings under provisions of Section 22 05 00. Include list of items identified, wording, letter sizes, and color coding.
- B. Include valve chart and schedule listing valve tag number, location, function, and valve manufacturer's name and model number.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- 1. 3M
- 2. Bunting
- 3. Calpico
- 4. Craftmark
- 5. Emedco
- 6. Kolbi Industries
- 7. Seton
- 8. W.H. Brady
- 9. Marking Services

#### 2.2 MATERIALS

- A. All pipe markers shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

OD of Pipe or Insulation	Marker Length	Size of Letters
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

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Plastic tags may be used for outside diameters under 3/4"

- B. Plastic Nameplates: Laminated three-layer phenolic with engraved black, 1/4" minimum letters on light contrasting background.
- C. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.
- D. Plastic Tags: Minimum 1-1/2" square or round laminated three-layer phenolic with engraved, 1/4" minimum black letters on light contrasting background.
- E. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.
- F. Plastic Pipe Markers: Semi-rigid plastic, preformed to fit around pipe or pipe covering; indicating flow direction and fluid conveyed.
- G. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.
- H. Ceiling Markers:
  - 1. Label Style:
    - a. The intent is for the ceiling labels to be inconspicuous but easy to find and read while standing underneath. The labels shall be located on the grid T-bar nearest the ceiling tile that can be removed to provide the best access to the serviceable side of equipment or to valves. An arrow can be used to point to the tile needing removal.
    - b. The label tape shall be approximately 1/2" wide with all capitalized letters approximately 3/16" tall.
    - c. Ceiling grid labels shall be made with a label maker with durable adhesive labels having a clear background and black letters.
    - d. Equipment labels shall be as designated on the drawings (e.g., WHA, TP, etc.).
    - e. Valve labels shall be designated by the size, service, and the valve tag number (e.g., 1-1/4" CW #123, 2" HWS #234, etc.). A single longer label can be used to identify multiple valves using spaces between the descriptors if the valves are located close together and have the same service (e.g., CW, HW, and HWC lines serving the same restroom, etc.).

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install all products per manufacturer's recommendations.
- B. Degrease and clean surfaces to receive adhesive for identification materials.

C. Valves:

1. All valves (except shutoff valves at equipment) shall have numbered tags.
2. Provide or replace numbered tags on all existing valves that are connected to new systems or that have been revised.
3. Provide all existing valves used to extend utilities to this project with numbered tags. Review tag numbering sequence with the Owner prior to ordering tags.
4. Secure tags with heavy duty key chain and brass "S" link or with mechanically fastened plastic straps.
5. Attach to handwheel or around valve stem.
6. Number all tags and show the service of the pipe.

D. Pipe Markers:

1. Adhesive Backed Markers: Use Brady Style 1, 2, or 3 on pipes 3" diameter and larger. Use Brady Style 4, 6, or 8 on pipes under 3" diameter. Similar styles by other listed manufacturers are acceptable. Secure all markers at both ends with a wrap of pressure sensitive tape completely around the pipe.
2. Snap-on Markers: Use Seton "Setmark" on pipes up to 5-7/8" OD. Use Seton "Setmark" with nylon or Velcro ties for pipes 6" OD and over. Similar styles by other listed manufacturers are acceptable.
3. Stencil Painted Pipe Markers:
  - a. Remove rust, grease, dirt, and all foreign substances from the pipe surface.
  - b. Apply primer on non-insulated pipes before painting.
  - c. Use background and letter colors as scheduled later in this section.
4. Apply markers and arrows in the following locations where clearly visible:
  - a. At each valve.
  - b. On both sides of walls that pipes penetrate.
  - c. At least every 20 feet along all pipes.
  - d. On each riser and each leg of each "T" joint.
  - e. At least once in every room and each story traversed.
5. Underground Pipe Markers: Install 8" to 10" below grade, directly above buried pipes.

E. Equipment:

1. All equipment not easily identifiable such as controls, relays, gauges, etc.; and all equipment in an area remote from its function shall have nameplates or plastic tags listing name, function, and drawing symbol. Do not label exposed equipment in public areas.
2. Provide engraved plastic tags at all hydronic or steam system makeup water meters.
3. Mechanical equipment that is not covered by the U.S. National Appliance Energy Conservation Act (NAECA) of 1987 shall carry a permanent label installed by the manufacturer stating that the equipment complies with the requirements of ASHRAE 90.1.

### 3.2 SCHEDULE

- A. Pipes to be marked shall be labeled with text as follows, regardless of which method or material is used:
1. HIGH TEMP HOT WATER OVER 240F: Black lettering; yellow background
  2. DOMESTIC COLD WATER: White lettering; green background
  3. DOMESTIC HOT WATER - 115F: White lettering; green background
  4. DOMESTIC HOT WATER - 140F: White lettering; green background
  5. DOMESTIC HOT WATER CIRCULATING - 115F: White lettering; green background
  6. DOMESTIC HOT WATER CIRCULATING - 140F: White lettering; green background
  7. SANITARY SEWER: Black lettering; yellow background
  8. VENT: Black lettering; yellow background
  9. NATURAL GAS: Black lettering; yellow background
  10. TEMPERED WATER: White lettering; green background
  11. TEMPERED WATER RETURN: White lettering; green background
  12. All Underground Pipes: Varies
- B. Non-Potable Piping: All piping conveying non-potable water shall be permanently identified by continuously painted along entire length of pipe and branches so the piping is readily distinguishable from piping carrying potable water. Pipe markers shall be located as described above.
1. NON-POTABLE WATER: White lettering; purple background
- C. Ceiling Markers:
1. CLEAN OUT
  2. WATER HAMMER ARRESTOR
  3. CONTROL VALVE
  4. TRAP PRIMER
  5. HWC BALANCING/CONTROL VALVE

END OF SECTION

## SECTION 22 07 19 - PLUMBING PIPING INSULATION

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Piping Insulation.
- B. Insulation Jackets.

#### 1.2 QUALITY ASSURANCE

- A. Applicator: Company specializing in piping insulation application with five years minimum experience.
- B. Materials: Listed and labeled for flame spread/smoke developed rating of no more than 25/50 when tested per ASTM E84 or UL 723 as required by code. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
- C. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

#### 1.3 REFERENCES

- A. ANSI/ASHRAE/IES Standard 90.1 (latest published edition) - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.
- C. ANSI/ASTM C534 - Elastomeric Foam Insulation.
- D. ASTM E84 - Surface Burning Characteristics of Building Materials.
- E. NFPA 255 - Surface Burning Characteristics of Building Materials.
- F. UL 723 - Surface Burning Characteristics of Building Materials.

## PART 2 - PRODUCTS

### 2.1 INSULATION

- A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75F; non-combustible. All-purpose polymer or polypropylene service jacket, listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.
- B. Type B: Flexible elastomeric foam insulation; closed-cell, sponge or expanded rubber (polyethylene type is not permitted); ANSI/ASTM C534 Grade 1 Type I for tubular materials; flexible plastic; 0.25 maximum 'K' value at 75F, listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code. Maximum 1" thick per layer where multiple layers are specified.
- C. Type D: Hydrous Calcium Silicate; ASTM C533; rigid molded pipe insulation; asbestos free; 0.40 'K' value at 300F; 1200F maximum service temperature; 16 gauge stainless steel tie wires on maximum 12" centers.

### 2.2 VAPOR BARRIER JACKETS

- A. All-purpose polymer or polypropylene service jacket vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.
- B. Polyvinylidene Chloride (PVDC or Saran) film and tape: Durable and highly moisture and moisture vapor resistant. Please refer to manufacturer's recommended installation guidelines.

### 2.3 JACKET COVERINGS

- A. Plastic Jackets and Fitting Covers: High impact, glossy white, [0.020"0.030" thick, self-extinguishing plastic. Suitable for use indoors or outdoors with ultraviolet inhibitors. Suitable for -40F to 150F. Listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust before applying insulation.

### 3.2 INSTALLATION

- A. General Installation Requirements:

1. Install materials per manufacturer's instructions, building codes and industry standards.
2. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.

B. Insulated Piping Operating Below 60F:

1. Insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
2. On piping operating below 60F in locations that are not mechanically cooled (e.g., penthouses, mechanical rooms, tunnels, chases at exterior walls, etc.), Type B insulation shall be used.
3. All balance valves with fluid operating below 60F shall be insulated with a removable plug wrapped with vapor barrier tape to allow reading and adjusting of the valve.

C. Insulated Piping Operating Between 60F and 140F:

1. Do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.

D. Insulated Piping Operating Above 140F:

1. Insulate fittings, valves, flanges, and strainers.
2. All balance valves with fluid operating above 140F shall be insulated and an opening shall be left in the insulation to allow for reading and adjusting the valve.

E. Exposed Piping:

1. Locate and cover seams in least visible locations.
2. Where exposed insulated piping extends above the floor, provide a sheet metal guard around the insulation extending 12" above the floor. Guard shall be 0.016" cylindrical smooth or stucco aluminum and shall fit tightly to the insulation.
3. On exposed piping serving kitchen equipment or plumbing fixtures, the piping shall be insulated unless local code allows it to be uninsulated. In no instance should the uninsulated portion of the piping be more than 4ft in developed length.

### 3.3 SUPPORT PROTECTION

A. Insulation with pipe size greater than 1-1/2" (38mm) shall be protected from sagging and crushing by one of the following means.

1. High Compressive Strength Insert: On all insulated piping greater than 1-1/2", provide shield with insulation insert of same thickness and contour as adjoining insulation at each support, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. Inserts shall be as follows:

- a. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a minimum 180-degree cylindrical segment the same length as metal shields. Inserts shall be:
- b. Cellular glass (Type C) (for all temperature ranges) with a minimum compressive strength of 90 psi is acceptable for pipe sizes 14" and below. For pipe sizes larger than 14", provide rolled steel plate in addition to the shield.
- c. Molded hydrous calcium silicate (Type D) (only use for pipes with operating temperatures above 90F, with a minimum compressive strength of 100 psi is acceptable for pipe sizes 14" and below. For pipe sizes larger than 14", provide rolled steel plate in addition to the shield.
- d. Polyisocyanurate insulation (Type E) (for pipes below 300F with a minimum compressive strength of 24 psi is acceptable for pipe sizes 3" and below, minimum 60 psi for pipe sizes 4" to 10". For pipe sizes larger than 10", provide rolled steel plate in addition to the shield Where insulation is installed on piping located within return air plenums and mechanical rooms, insulation shall be listed and labeled at no more than 25/50 when tested per ASTM E84 or UL 723 as required by code.
- e. Phenolic (Type F) (for pipes operating below 250F with a minimum compressive strength of 90 psi is acceptable for pipe sizes 14" and below. For pipe sizes larger than 14", provide rolled steel plate in addition to the shield.
- f. Provide metal shields between hangers or supports and the pipe insulation/insert. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.

- 1) Shields shall be at least the following lengths and gauges:

Pipe Size	Shield Size
1/2" to 3-1/2"	12" long x 18 gauge
4"	12" long x 16 gauge
5" to 6"	18" long x 16 gauge
8" to 14"	24" long x 14 gauge
16" to 24"	24" long x 12 gauge

- g. Where rolled steel plate is noted above, provide minimum 1/4" (6mm) rolled galvanized steel plates in addition to the shield as reinforcement on large pipes as noted above to reduce point loading on roller, trapeze hanger and strut support locations depending on insulation compressive strength.
2. Premanufactured Insulation Insert/Shield: As an alternative to separate pipe insulation insert and saddle, properly sized manufactured integral rigid insulation insert and shield assemblies may be used.
    - a. Products:
      - 1) Buckaroo CoolDry
      - 2) Cooper/B-Line Fig. B3380 through B3384

- 
- 3) Pipe Shields A1000, A2000
3. Premanufactured Insulation Couplings:
- a. Molded thermoplastic slip coupling, -65F to 275F, sizes up to 4-1/8" OD, and receive insulation thickness up to 1". Suitable for use indoors or outdoors with UV stabilizers. Vertical insulation riser clamps shall have a 1,000lb vertical load rating. On cold pipes operating below 60F, cover joint and coupling with vapor barrier mastic to ensure continuous vapor barrier.
  - b. PET thermoplastic foam load bearing core with elastomeric foam ends and lap-seal jacket.
  - c. Horizontal Strut Mounted Insulated Pipe Manufacturers:
    - 1) Klo-Shure or equal
    - 2) Armafix Ecolight
  - d. Vertical:
    - 1) Manufacturers: Klo-Shure Titan or equal
4. Premanufactured shield/saddle for use with Elastomeric Foam (Type B): Molded thermoplastic rigid pipe saddle sized for insulation outside diameter. Length as required by manufacturer.
- B. Rectangular blocks, plugs, or wood material are not acceptable.
- C. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor. Refer to Supports and Anchors specification section for additional information.
- D. Neatly finish insulation at supports, protrusions, and interruptions.
- E. Ferrous hot piping 4 inches and larger, provide steel saddle at rollers as described in Section 22 05 29 "Plumbing Supports and Anchors".
- 3.4 INSULATION
- A. Type A Insulation:
- 1. All Service Jackets: Seal all longitudinal joints with self-seal laps using a single pressure sensitive adhesive system. Do not staple.
  - 2. Insulation without self-seal lap may be used if installed with Benjamin Foster 85-20 or equivalent Chicago Mastic, 3M or Childers lap adhesive.
  - 3. Apply insulation with laps on top of pipe.

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4. Fittings, Valve Bodies and Flanges: For 4" and smaller pipes, insulate with 1 lb. density insulation wrapped under compression to a thickness equal to the adjacent pipe insulation. For pipes over 4", use mitered segments of pipe insulation. Finish with preformed plastic fitting covers. Secure fitting covers with pressure sensitive tape at each end. Overlap tape at least 2" on itself. For pipes operating below 60F, seal fitting covers with vapor retarder mastic in addition to tape.

B. Type B Insulation:

1. Install per manufacturer's instructions or ASTM C1710.
2. Elastomeric Cellular Foam: Where possible, slip insulation over the open end of pipe without slitting. Seal all butt ends, longitudinal seams, and fittings with adhesive. At elbows and tees, use mitered connections. Do not compress or crush insulation at cemented joints. Joints shall be sealed completely and not pucker or wrinkle. Exterior installations shall contain factory applied polymeric, moisture, and UV resistant covering with ends sealed with adhesive and similar cover; or Contractor shall paint the outside of outdoor insulation with two coats of latex enamel paint recommended by the manufacturer.
3. Insulation Installation on Straight Pipes and Tubes:
  - a. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
  - b. Insulation must be installed in compression to allow for expansion and contraction. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.
4. Insulation Installation on Valves and Pipe Specialties:
  - a. Install preformed sections of same material as straight segments of pipe insulation when available.
  - b. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
  - c. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

C. Type D Insulation:

1. Use pre-molded half sections. Butt longitudinal and circumferential joints tightly. Wire in place with 16 gauge stainless steel wire on maximum 12" centers.
2. Apply in two layers. Stagger all joints between layers. Wire each layer individually.

D. Type F Insulation:

1. Seal all longitudinal joints with manufacturer approved adhesive or mastic. Secure butt joint strips in a similar manner.

2. Indoors, above grade or below grade, polyvinylidene chloride (PVDC or Saran) vapor retarder film and tape: Seal all longitudinal joints with manufacturer approved adhesive. Secure butt joint strips in a similar manner. Refer to manufacturer's recommendations for installation guidelines.
3. Insulate pipe fittings with prefabricated insulation fittings.

### 3.5 JACKET COVER INSTALLATION

#### A. Plastic Covering:

1. Provide vapor barrier as specified for insulation type. Cover with plastic jacket covering. Position seams to shed water.
2. Solvent weld all joints with manufacturer recommended cement.
3. Overlap all laps and butt joints 1-1/2" minimum. Repair any loose ends that do not seal securely. Solvent weld all fitting covers in the same manner. Final installation shall be watertight.
4. All joints in areas noted shall meet USDA standards for Totally Sealed Systems, including overlaps of 1" on circumferential and 1.5" to 2" on longitudinal seams.
5. Use plastic insulation covering on all exposed pipes including, but not limited to:
  - a. All exposed piping in finished spaces unless noted otherwise on the drawings.
  - b. All exposed piping in locker rooms.
  - c. All exposed piping in kitchen areas.
  - d. All exposed piping adjacent to cloud ceilings.
  - e. All exposed piping in unfinished areas as noted on drawings (e.g., storage rooms, janitor's closets, utility rooms, etc.).
  - f. All exposed piping in mechanical or equipment rooms below 8'-0" above floor.
  - g. All exposed piping in mechanical rooms that is subject to damage from normal operations. (Example: Piping that must be stepped over routinely.)
  - h. All exposed piping in tunnels designated as passageways, equipment access, or egress.
6. Elastomeric piping insulation may have two coats of latex paint instead of plastic jacket.

### 3.6 SCHEDULE

- A. Insulation requiring re-installation/repair shall match existing materials and meet requirements of these specifications. .

END OF SECTION



## SECTION 22 10 00 - PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Pipe and Pipe Fittings.
- B. Valves.
- C. Check Valves.

#### 1.2 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ANSI/ASME Sec 9 or ANSI/AWS D1.1.
- D. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
  - 1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.
- E. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.

#### 1.3 REFERENCES

- A. ANSI/ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
- B. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- C. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- D. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- E. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.
- F. ANSI/ASTM B32 - Solder Metal.

- G. ANSI/ASTM D2466 - PVC Plastic Pipe Fittings, Schedule 40.
- H. ASSE 1003 - Water Pressure Reducing Valves for Domestic Water Supply Systems.
- I. ASTM A74 - Hub and Spigot Cast Iron Soil Pipe and Fittings.
- J. ASTM A888 - Hubless Cast Iron Soil Pipe and Fittings.
- K. ASTM B88 - Seamless Copper Water Tube.
- L. ASTM B306 - Copper Drainage Tube (DWV).
- M. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- N. ASTM C1540 - Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.
- O. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- P. ASTM D1785 - Polyvinylchloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- Q. ASTM D2661 - ABS DWV Pipe & Fittings.
- R. ASTM D2665 - PVC DWV Pipe & Fittings.
- S. ASTM D3034 - Type PSM (Polyvinylchloride) (PVC) Sewer Pipe and Fittings.
- T. ASTM F402 - Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.
- U. ASTM F437 - Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- V. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- W. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipes.
- X. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- Y. ASTM F656 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
- Z. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing.

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- AA. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing.
  - BB. ASTM F2618 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Fittings for Chemical Waste Drainage Systems.
  - CC. AWS A5.8 - Brazed Filler Metal.
  - DD. AWWA C651 - Disinfecting Water Mains.
  - EE. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
  - FF. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
  - GG. FM 1680 - Couplings Used in Hubless Cast Iron Systems.
  - HH. NSF - National Sanitation Foundation
- 1.4 DELIVERY, STORAGE, AND HANDLING
- A. Deliver and store valves in shipping containers with labeling in place.

## PART 2 - PRODUCTS

### 2.1 CAST IRON PIPE

- A. Cast Iron; Standard Weight; Hub and Spigot Joints:
  1. Pipe: Standard weight hub and spigot cast iron soil pipe, bituminous corrosion protective coating inside and outside, CISPI 301 or ASTM A74.
  2. Design Pressure: Gravity Maximum Design Temperature: 180F.
  3. Joints: Compression gasket, ASTM C564.
  4. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 301. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.
  5. Adapters: Heavy duty no-hub transition for joining cast iron and PVC pipe. Adapters shall be tested and certified to ASTM C 1460 and be constructed with Type 304 stainless steel shield, thickness 0.015" shield, gasket material to meet ASTM C564, 1-1/2" to 4" will be 3" wide with four 304 stainless steel bands, and 6" to 10" will be 4" wide with six 304 stainless steel bands and 3/8" 305 stainless steel hex head screws torqued to 80 inch pounds.
- B. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets:
  1. Pipe: Standard weight no-hub cast iron soil pipe, bituminous corrosion protective coating inside and outside, CISPI 301 or ASTM A74.
  2. Design Pressure: Gravity Maximum Design Temperature: 180F.

3. Joints: ASTM C1540, FM 1680, and ASTM C-564.
  - a. Super Duty, Shielded Stainless Steel Couplings: Neoprene sleeve gasket, 0.015" thick 304 stainless steel shield , stainless steel 3/8" screw type clamps, minimum of four clamps for 1-1/2" to 4" and six clamps for 5" and larger pipe sizes. Clamps shall be tightened to minimum 80 inch pounds or as manufacturer requires. Husky SD-4000 or equal.
4. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 310. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.
5. Adapters: Transition from cast iron soil pipe to other pipe materials with manufactured adapters specifically for the application. Adapter must meet the same requirements as the joints listed above. ASTM C1460. Sticker identifying transition fitting application must be visible to view. For example, the most commonly used transition fitting from cast iron no-hub to PVC would be the Husky SD-4200 series.

C. Cast Iron; Standard Weight Epoxy Coated; No-Hub Sleeve Gaskets:

1. Pipe and Fittings: Standard weight no-hub cast iron soil pipe, CISPI 301 or ASTM A74, epoxy paint corrosion protective coating inside and outside, EN-877.
2. Joints: ASTM C1540 and FM 1680.
  - a. Super Duty, Shielded Stainless Steel Couplings: Neoprene sleeve gasket, 0.015" thick 304 stainless steel shield , stainless steel 3/8" screw type clamps, minimum of four clamps for 1-1/2" to 4" and six clamps for 5" and larger pipe sizes. Clamps shall be tightened to minimum 80 inch pounds or as manufacturer requires. Husky SD-4000 or equal.
3. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 301. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.
4. Adapters: Transitions from cast iron soil pipe to other pipe materials with manufactured adapters specifically for the application. Adapter must meet the same requirements as the joints listed above. ASTM C1460. Sticker identifying transition fitting application must be visible to view.

2.2 COPPER PIPE

A. Copper Pipe; Type L; Solder Joints:

1. Pipe: Type L hard drawn seamless copper tube, ASTM B88.
2. Design Pressure: 175 psi; Maximum Design Temperature: 200F.
3. Joints: Solder with 100% lead-free solder and flux, ASTM B32.
4. Fittings: Wrought copper solder joint, ANSI B16.22.

B. Copper Pipe; Type L; Mechanical Press Connection:

1. Pipe: Type L hard drawn seamless copper tube, ASTM B88.
  2. Design Pressure: 175 psi; Maximum Design Temperature: 200F.
  3. Joints: Mechanical press connection.
  4. Fittings: Copper, ANSI B-16.22, with embedded EPDM O-ring / sealing element engineered for this application, NSF-61.
  5. Fitting Identification: Press ends shall provide the ability to identify an unpressed fitting from the floor prior to testing. The function of this feature is to provide the installer quick and easy identification of connections that have not been pressed prior to putting the system into operation.
  6. Special Requirements: Mechanical press fitting manufacturer shall provide Contractor training prior to installation.
  7. Manufacturers:
    - a. Viega ProPress
    - b. Apollo Press, a division of Aalberts - IPS
    - c. NIBCO Press System Fittings and Valves
    - d. Merit Brass
    - e. Mueller Streamline PRS
- C. Fittings: Wrought copper solder joint, ANSI B16.2Copper Pipe; Type K; Mechanical Press Connection:
1. Pipe: Type K annealed copper tube, ASTM B88.
  2. Design Pressure: 150 psi. Maximum Design Temperature: 200F.
  3. Joints: Mechanical press connection.
  4. Fittings: Copper, ANSI B-16.22, with embedded EPDM O-ring, NSF-61 / sealing element engineered for this application.
  5. Fitting Identification: Press ends shall provide the ability to identify an unpressed fitting from the floor prior to testing. The function of this feature is to provide the installer quick and easy identification of connections that have not been pressed prior to putting the system into operation.
  6. Special Requirements: Mechanical press fitting manufacturer shall provide contractor training prior to installation.
  7. Manufacturers:
    - a. Viega ProPress
    - b. Apollo Press, a division of Aalberts - IPS
    - c. NIBCO Press System Fittings and Valves
    - d. Merit Brass
    - e. Mueller Streamline PRS.
- D. Copper Pipe: Type DWV; Solder Joints:
1. Pipe: Type DWV hard temper seamless copper drainage tube, ASTM B306.
  2. Design Pressure: Gravity Maximum Design Temperature: 180F.
  3. Joints: Solder with 100% lead-free solder and flux, ASTM B32.

4. Fittings: Cast brass solder joint drainage type, ANSI B16.23 or wrought copper solder joint drainage type, ANSI B16.29.

E. Copper Pipe: Type M; Solder Joints:

1. Pipe: Type M hard temper seamless copper drainage tube, ASTM B306.
2. Design Pressure: Gravity Maximum Design Temperature: 180F.
3. Joints: Solder with 100% lead-free solder and flux, ASTM B32.
4. Fittings: Cast brass solder joint drainage type, ANSI B16.23 or wrought copper solder joint drainage type, ANSI B16.29.

## 2.3 PLASTIC PIPE

A. Cross-Linked Polyethylene (PEX); Cold Expansion Joint:

1. Pipe: Cross-linked polyethylene (PEX-a or PEX-b), SDR-9, ASTM F876, NSF Certified, manufacturer approved for cold expansion fittings ASTM F1960.
2. Design Pressure/Temperature: 100 psig at 180F.
3. Joints: Bending the pipe greater than eight (8) times the outside diameter shall be permitted. Bends less than eight (8) times the outside diameter shall be barbed insertion fittings provided by the manufacturer.
4. Fittings: Cold expansion joint compatible with engineered polymer or lead-free brass construction System shall conform to ASTM F1960.
5. Limitations: Shall not be used in a return air plenum unless specifically listed to ASTM E84/UL723.

B. PVC-DWV or ABS-DWV; Schedule 40; Solvent Weld Joints:

1. Pipe: Schedule 40 rigid, PVC-DWV, or ABS-DWV, cell classification 12454 for PVC per ASTM D1784 or 42222 for ABS per ASTM D3965, with plain ends, conforming to ASTM Standards D2665 or D2661. Cellular core piping is not acceptable.
2. Design Pressure/Temperature: Gravity at 140F.
3. Joints: Solvent-weld socket type with solvent recommended by pipe manufacturer.
4. Fittings: PVC-DWV, or ABS-DWV, cell classification 12454 for PVC per ASTM D1784 or 42222 for ABS per ASTM D3965, with solvent-weld socket type ends for Schedule 40 pipe.
5. Limits: Schedule 40 PVC-DWV, or ABS-DWV pipe must not be threaded. Do not use where exposed or in return air plenums.
6. Use: Use PVC or ABS only where allowed by local jurisdiction. Comply with all special requirements or limitations.

## 2.4 VALVES

A. Shutoff Valves:

1. For pipe systems where mechanical press connections are allowed, shutoff valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.

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2. Gate Valves:

- a. GA-2: 2-1/2" thru 12", 200 psi CWP at 150F, flanged, iron body, bronze mounted, OS&Y, lead free NSF-372. Hammond IR1146-HI, Milwaukee F-2885-MRW, Watts #F-503, NIBCO F-607-RWSB, Apollo Valves; a division of Aalberts- IPS 611F.
- b. GA-12: 2-1/2" thru 12", 200 psi CWP, flanged ends, iron body, resilient wedge, "O" ring stem seals, non-rising stem with mounting flange for indicator post or valve box and 2" square nut, counter-clockwise to open, AWWA, lead free NSF-372. Mueller A-2361 Series, Kennedy #C509 Series 8401A.
- c. GA-13: 2" thru 12", 200 psi CWP, mechanical joint ends, iron body, resilient wedge, "O" ring stem seals, non-rising stem with mounting flange for indicator post or valve box and 2" square nut, counter-clockwise to open, AWWA, lead free NSF-372. Mueller #A-2361 Series with HYMAX Grip Restraint, Kennedy C509 Series 8701.

3. Butterfly Valves:

a. BF-1:

- 1) 2-1/2" thru 6", 175 psi CWP, elastomers rated for 20F to 250F at 125 psig, fully lugged end, ductile or cast iron body (not in contact with fluid); bronze, aluminum-bronze or stainless steel disc; EPDM seat, stainless steel stem, lead free NSF-372, extended neck, 175 psi bubble-tight, bi-directional dead-end shutoff without backing flange or nuts and with cap screws extending to centerline of valve body (for pipe extension without draining system), 10 position locking operator up to 6" size. Cv of at least 1580 in 6" size.
- 2) Manufacturers:
  - a) Apollo Valves; a division of Aalberts-IPS LD141
  - b) Watts #DBF-03-121-1P
  - c) NIBCO N200 Series or LD2000 Series
  - d) Milwaukee CL series
  - e) Hammond 5200 series
  - f) Jomar 600-\_\_DSEL series
  - g) Metraflex #Butterfly Valve, DINC DISK
- 3) 8" thru 12", 175 psi CWP, elastomers for 20F to 225F at 130 psi, fully lugged end, ductile or cast iron body (not in contact with fluid), bronze, stainless steel, electroless coated ductile iron or aluminum-bronze disc, EPDM seat, stainless steel stem, lead free NSF-372, extended neck, 175 psi bubble-tight, bi-directional dead-end shutoff without backing flange or nuts and with cap screws extending to the centerline of the valve body (to permit pipe extension without draining system), weatherproof gear operator.
- 4) Manufacturers:

- a) Apollo Valves; a division of Aalberts-IPS LD141
  - b) Watts #DBF-03-121-1G
  - c) NIBCO N200 Series or LD2000 Series
  - d) Milwaukee CL series
  - e) Hammond 5200 series
  - f) Jomar 600-\_\_DSEG series
  - g) Metraflex #Butterfly Valve, DINC DISK
- 5) Mechanically coupled grooved end valves are acceptable if they have the features listed above.
- a) Cast brass body to UNS C87850. (Alloy code shall be cast or stamped into the valve body.) Aluminum bronze disc to UNS C95500, with pressure responsive elastomer seat. Stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating. Victaulic #608N, Shurjoint; a division of Aalberts-IPS #SJ-C300.
  - b) Grooved end stainless steel body and disc, Grade CF8M, conforming to ASTM A351, with blow-out proof 17-4PH stainless steel stems to ASTM A564. Disc shall be connected to the stem without the use of fasteners or pins, and be offset from the stem centerline to provide a full 360-degree continuous contact with the seating surface when closed. Seat shall be pressure responsive, Grade P fluoroelastomer. Victaulic Series 861 Vic-300 MasterSeal Valve.

4. Ball Valves:

- a. BA-1: 3" and under, 600 psi CWP, full port, threaded or solder ends (acceptable only if rated for soldering in line with 470F melting point of lead-free solder), stainless steel ball and trim, Teflon seats and seals.
  - 1) Body: Lead free NSF-372, two-piece bronze of a copper alloy containing less than 15% zinc. Apollo Valves; a division of Aalberts-IPS #77CLF140/240 Series, Milwaukee #UPBA450S, Watts #LFB6080G2-SS, NIBCO #T-585-66-LF, Jomar T-200CSSG.
  - 2) Body: Dezincification resistant brass alloy, lead free NSF-372. Jomar T-100CSSG.
  - 3) Provide solid extended shaft for all insulated piping. (For example, Apollo adds option -04 Stem Extension, NIBCO Nib-Seal Handle-NS, and Jomar modifies valve part number with -IH for insulated handle.)
  - 4) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120F, heating water piping over 120F, steam, condensate, boiler feed water piping, and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lockout trim. (For example, Jomar and NIBCO modify valve part number with -LH for locking handle.)

- b. BA-1A: 2-1/2" and 3", 275 psi CWP ANSI Class, 150 psi standard port, carbon steel body, stainless steel ball and trim, Teflon seats and seals. Apollo Valves, a division of Aalberts-IPS #88A-140, NIBCO #F510-CS/66, Milwaukee #F90.
  - 1) Provide extended shaft for all valves in insulated piping.
  - 2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120F, heating water piping over 120F, condensate, boiler feed water piping, and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.
- c. BA-11: 2" and under, 300 psig water, standard port, screwed or compression. Bronze body and ball of a copper alloy containing less than 15% zinc, chrome plated, Teflon coated, or stainless steel ball. Teflon or Buna-N seats, lead free NSF-372. One piece "T" style cap and stem. A.Y. McDonald 6100 Series, Mueller 300 Series.
- d. BA-12: 2" and under, 300 psig water, standard port, screwed or compression. Bronze body and ball of a copper alloy containing less than 15% zinc, chrome plated, Teflon coated, or stainless steel ball. Teflon or Buna-N seats, lead free NSF-372. One piece "T" style cap and stem. Minneapolis Pattern threaded top. A.Y. McDonald 6100 Series, Mueller 300 Series.

## 2.5 STRAINERS

- A. For pipe systems where mechanical press connections are allowed, strainers with mechanical press connections are acceptable subject to the requirements in the paragraphs below.
- B. ST-1: Threaded Ends, 4" and under, lead free bronze or 304 stainless steel body, threaded connections, threaded removable cover, 0.045" 304 stainless steel perforated screen, 200 psi CWP at 150F. Apollo Valves, a division of Aalberts-IPS YB-LF (59LF), Metraflex SSFT, Mueller / Watts LF351, Watts LF777, Jomar T-651G, Zurn SXL.
- C. ST-2: Flanged Ends, 2-1/2" thru 12", Lead free cast iron with FDA/NSF approved electrostatically applied fusion bonded epoxy coating body, flanged connections, bolted or flanged cover, 304 stainless steel perforated screen, 200 psi CWP. Watts 77F-DI-FDA-125, Victaulic Series 969-F, Apollo Valves, a division of Aalberts-IPS YCF0XM40E, Zurn FSC.
- D. ST-3: Grooved Ends, 2-1/2" thru 8", Ductile iron to ASTM A536 with electrostatically applied fusion bonded epoxy coating or stainless steel body, grooved connections, bolted or grooved removable cover, 304 stainless steel perforated screen, 175 psi. Victaulic Series 968-F or 968-F-SS, Watts 77F-SS.

## 2.6 CHECK VALVES

- A. For pipe systems where mechanical press connections are allowed, check valves with mechanical press connections are acceptable subject to the requirements in the paragraphs below.

- B. CK-1: Threaded Ends, 2" and under, 200 psi CWP at 150F, threaded connection, lead free bronze body with brass or bronze disc, horizontal swing. Hammond #UP904, Milwaukee #UP509, NIBCO T-413-Y-LF, Jomar T-511G, Apollo Valves, a division of Aalberts-IPS #161T-LF.
- C. CK-2 :Wafer Style, 2-1/2" thru 12", 200 psi CWP, double disc wafer type, lead free bronze or iron body, bronze trim, metal-to-metal, Buna-N, or EPDM seat, 316 SS shaft. NIBCO W-920-W-LF, Apollo Valves, a division of Aalberts-IPS 910WE-LF, Milwaukee UP1400, Watts ICV-125-2-2-T.

## 2.7 LOCK OUT TRIM

- A. Provide lock out trim for all quarter turn shutoff valves opening to atmosphere and installed in domestic water piping over 120F and as indicated on the drawings.

## 2.8 VALVE OPERATORS

- A. Provide handwheels for gate valves and gear operators for butterfly valves.

## 2.9 VALVE CONNECTIONS

- A. Provide all connections to match pipe joints. Valves shall be same size as pipe unless noted otherwise.

## 2.10 CONNECTIONS BETWEEN DISSIMILAR METALS

- A. Connections between dissimilar metals shall be insulating dielectric types that provide a water gap between the connected metals, and that either allow no metal path for electron transfer or that provide a wide water gap lined with a non-conductive material to impede electron transfer through the water path.
- B. Joints shall be rated for the temperature, pressure, and other characteristics of the service in which they are used, including testing procedure.
- C. Aluminum, iron, steel, brass, copper, bronze, galvanized steel and stainless steel are commonly used and require isolation from each other with the following exceptions:
  - 1. Iron and steel connected to each other.
  - 2. Brass, copper, and bronze connected to each other.
  - 3. Brass or bronze valves and specialties connected in closed systems with steel, iron, or stainless steel on both sides of the brass or bronze valves and specialties. Where two or more brass or bronze items occur together, they shall be connected with brass nipples. Brass or bronze valves and specialties cannot be used as a dielectric separation between pipe materials.
- D. Dielectric protection is required at connections to equipment of a material different than the piping.

- E. Screwed and/or Grooved Joints (acceptable up to 4" size):
  - 1. Dielectric waterway rated for 300 psi CWP and 225F.
  - 2. Optional: Copper-silicon casting conforming to UNS C87850 with grooved and/or threaded ends.
  - 3. UL classified in accordance with ANSI / NSF-61 for potable water service.
  - 4. Manufacturers:
    - a. Elster Group ClearFlow fittings
    - b. Victaulic Series 647
    - c. Grinnell Series 407
    - d. Matco-Norca

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Install all products per manufacturer's recommendations.
- B. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- C. Remove scale and dirt, on inside and outside, before assembly.
- D. Remove all scale, rust, dirt, oils, stickers and thoroughly clean exterior of all bare metal exposed piping, hangers, and accessories in preparation to be painted.
- E. Connect to equipment with flanges or unions. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.
- F. Use only piping materials rated for the maximum temperature of the application, e.g., do not use PVC for dishwasher drainage or piping that receives boiler blowdown.
- G. Roof Penetration (Vent) Flashing:
  - 1. Built-up Roofing: Flash vents with 3# seamless sheet lead of sufficient size to extend 15" into roofing felts for built-up roofs.
  - 2. Membrane, Metal or Shingled Roofs: Flash vents with premolded pipe flashing cones for single-ply membrane roofs, metal roofs, or shingled roofs.

#### 3.2 SYSTEM, PIPING AND VALVE SCHEDULE

- A. Cold Water, Hot Water, Tempered Water, Reclaimed Water - Potable and Non-Potable (Above Ground):
  - 1. Copper Pipe; Type L; Solder Joints: All Sizes
  - 2. Copper Pipe; Type L; Mechanical Press Connection: 4" and Under

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3. Copper Pipe; Type L; Mechanically Coupled Grooved Joints: 2-1/2" to 8"
  4. Stainless Steel; Schedule 5; Type 304; Mechanical Press Connection: 4" and Under
  5. Galvanized Steel; Standard Weight; Threaded Joints: 6" and Over
  6. Rigid Chlorinated Polyvinyl Chloride (CPVC); SDR-11; Solvent Weld Joints: 2" and Under
  7. Shutoff Valves: BF-1, BA-1
  8. Throttling Valves: GL-1, GA-2
  9. Check Valves: CK-1, CK-2
- B. Strainers: ST-1, ST-2 Cold Water, Hot Water, Tempered Water, Reclaimed Water - Potable and Non-Potable (Underground):
1. Copper Pipe; Type K; Solder Joints: All Sizes
  2. Copper Pipe; Type K; Mechanical Press Connection: 4" and Under
  3. Cross-Linked Polyethylene (PEX); Cold Expansion Joint: 3" and Under
- C. Combination Water and Fire Protection Service:
1. Copper Pipe; Type K; Solder Joints: 2" and under
  2. PVC Pressure Pipe; Class 235, C900; Push-On Joints - Pressure Pipe: All Sizes
  3. Shutoff Valves: GA-2, GA-12, GA-13, BA-11, BA-12
  4. Strainers: ST-1, ST-2, ST-3
  5. Valve Box: VB-1, VB-2, VB-3
- D. Sanitary Waste and Vent, Gravity (Above Ground):
1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
  2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15" Cast Iron; Standard Weight Epoxy Coated; No-Hub Sleeve Gaskets: 1-1/2" to 15"
  3. Copper Pipe: Type DWV; Solder Joints: 1-1/4" to 4"
  4. Copper Pipe: Type M; Solder Joints: 1-1/4" to 4"
  5. PVC-DWV or ABS-DWV; Schedule 40; Solvent Weld Joints: All Sizes
- E. Sanitary Indirect Drainage (Above Ground):
1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
  2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15" Cast Iron; Standard Weight Epoxy Coated; No-Hub Sleeve Gaskets: 1-1/2" to 15"
  3. Copper Pipe: Type DWV; Solder Joints: 1-1/4" to 4"
  4. Copper Pipe: Type M; Solder Joints: 1-1/4" to 4"
  5. PVC-DWV or ABS-DWV; Schedule 40; Solvent Weld Joints: All Sizes
- F. Sanitary Waste and Vent, Gravity (Underground - Inside Building):
1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
  2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"
  3. Cast Iron; Standard Weight Epoxy Coated; No-Hub Sleeve Gaskets: 1-1/2" to 15"

G. Sanitary Waste and Vent, Gravity (Underground - Outside Building):

1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
2. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets: 1-1/2" to 15"
3. Cast Iron; Standard Weight Epoxy Coated; No-Hub Sleeve Gaskets: 1-1/2" to 15"

H. Sanitary Waste - Pumped (Above Ground - Inside Building):

1. Copper Pipe; Type K; Solder Joints: All Sizes
2. Copper Pipe; Type K; Mechanical Press Connection: All Sizes
3. Shutoff Valves: BA-1, BA-1A, BF-1, GA-7
4. Check Valves: CK-1

3.3 CLEANING PIPING

A. All Water Piping:

1. Flush all piping using faucets, flush valves, etc. until the flow is clean.
2. After flushing, thoroughly clean all inlet strainers, aerators, and other such devices.
3. If necessary, remove valves to clean out all foreign material.

3.4 INSTALLATION

A. General Installation Requirements:

1. Provide dielectric connections between dissimilar metals.
2. Route piping in orderly manner and maintain gradient. Install to conserve building space.
3. Group piping whenever practical at common elevations.
4. Install piping to allow for expansion and contraction without stressing pipe, joints, or equipment.
5. Slope water piping and arrange to drain at low points.
6. Install bell and spigot piping with bells upstream.
7. Where pipe supports are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
8. Seal pipes passing through exterior walls with a wall seal per Section 22 05 03. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.
9. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.
10. All vertical pipe drops to sinks or other equipment installed below the ceiling shall be routed within a wall cavity, unless specifically noted otherwise to be surface mounted. For renovation projects, this Contractor is responsible for opening and patching existing walls for installation of piping. Wall patching shall match existing condition.

B. Valves/Fittings and Accessories:

1. Install shutoff valves that permit the isolation of equipment/fixtures in each room without isolating any other room or portion of the building. Individual fixture angle stops do not meet this requirement. Exception: Back-to-back rooms in no more than two adjacent rooms.
2. Provide clearance for installation of insulation and access to valves and fittings.
3. Provide access doors for concealed valves and fittings.
4. Install valve stems upright or horizontal, not inverted.
5. Provide one plug valve wrench for every ten plug valves 2" and smaller, minimum of one. Provide each plug valve 2-1/2" and larger with a wrench with set screw.
6. Install corrugated, stainless steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

C. Sanitary and Storm Piping:

1. Install all sanitary and storm piping inside the building with a slope as shown on the drawings.
2. Install horizontal offset at all connections to roof drains to allow for pipe expansion.
3. Slope sanitary and storm piping outside the building to meet invert elevations shown on drawings and to maintain a minimum velocity of 2 feet per second.
4. Sway Bracing: Where horizontal sanitary and/or storm pipes 4 inches and larger change flow direction greater than 45 degrees, rigid bracing or thrust restraints shall be installed to resist movement of the upstream pipe in the direction of pipe flow. The rigid bracing or thrust restraint shall be connected to structure. A change of flow direction from horizontal into a vertical pipe does not require the upstream pipe to be braced.
5. Starter fittings with internal baffles are not permitted.

### 3.5 PIPE ERECTION AND LAYING

- A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be removed from the job immediately.
- B. All pipe, fittings, valves, equipment and accessories shall have factory applied markings, stampings, or nameplates with sufficient data to determine their conformance with specified requirements.
- C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not install any item that is not clean.
- D. Until system is fully operational, all openings in piping and equipment shall be kept closed except when actual work is being performed on that item or system. Closures shall be plugs, caps, blind flanges or other items specifically designed and intended for this purpose.

- E. Run pipes straight and true, parallel to building lines with minimum use of offsets and couplings. Provide only offsets required to provide needed headroom or clearance and to provide needed flexibility in pipe lines.
- F. Make changes in direction of pipes only with fittings or pipe bends. Changes in size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified.
- G. Provide flanges or unions at all final connections to equipment, traps and valves.
- H. Arrange piping and connections so equipment served may be totally removed without disturbing piping beyond final connections and associated shutoff valves.
- I. Use full and double lengths of pipe wherever possible.
- J. Unless otherwise indicated, install all piping, including shutoff valves and strainers, to coils, pumps and other equipment at line size with reduction in size being made only at control valve or equipment.
- K. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.
- L. Unless otherwise indicated, branch take-offs shall be from top of mains or headers at either a 45-degree or 90-degree angle from the horizontal plane for air lines, and from top, bottom or side for liquids.
- M. Do not use geotextile fabric with footing tile if silt content of soil exceeds 40% or if clay content exceeds 50%. The fabric shall be installed around 1" river rock or 2" limestone.

### 3.6 DRAINING AND VENTING

- A. Unless otherwise indicated on the drawings, all horizontal water lines, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate and venting.
- B. Maintain accurate grade where pipes pitch or slope for venting and drainage. No pipes shall have pockets due to changes in elevation.
- C. Provide drain valves at all low points of water piping systems for complete or sectionalized draining.
- D. Use eccentric reducing fittings on horizontal runs when changing size of pipes for proper drainage and venting. Install gravity drain pipes with bottom of pipe and eccentric reducers in a continuous line; all other liquid lines with top of pipe and eccentric reducers in a continuous line.
- E. Provide air vents at high points and wherever else required to eliminate air in all water piping systems.

- F. Install air vents in accessible locations. If necessary to trap and vent air in a remote location, install an 1/8" pipe from the tapping location to an accessible location and terminate with a venting device.
- G. All vent and drain piping shall be of same materials and construction for the service involved.

### 3.7 PLUMBING VENTS

- A. Vent as shown on the drawings and in accordance with all codes having jurisdiction.

### 3.8 BRANCH CONNECTIONS

- A. For domestic water and vent systems only, make branch connections with standard tee or cross fittings of the type required for the service.
- B. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.
- C. Do not use double wye or double combination wye and eighth bend DWV fittings in horizontal piping.
- D. Branch connections from the headers and mains may be mechanically formed using an extraction device. The branch piping connection shall be brazed connection for the following services only:
  - 1. Domestic water piping above ground.
- E. Further limit use of mechanically formed fittings as follows:
  - 1. Must have at least same pressure rating as the main.
  - 2. Main must be Type K or L copper tubing.
  - 3. Permanent marking shall indicate insertion depth and orientation.
  - 4. Branch pipe shall conform to the inner curve of the piping main.
  - 5. Main must be 1" or larger.
  - 6. Branch must be 3/4" or larger.

### 3.9 JOINING OF PIPE

- A. Threaded Joints (Galvanized Steel Pipe):
  - 1. Threads shall conform to ANSI B2.1 "Pipe Threads".
  - 2. Protect plated pipe and valve bodies from wrench marks when making up joints.
  - 3. Apply thread lubricant to male threads as follows:
    - a. Vents and Roof Conductors: Red graphite
    - b. All Other Services: Teflon tape

B. Flanged Joints (Galvanized Steel Pipe):

1. Steel pipe flanges shall conform to ANSI B16.5 "Steel Pipe Flanges and Flanged Fittings". Cast iron pipe flanges shall conform to ANSI B16.1 "Cast Iron Flanged and Flanged Fittings". Steel flanges shall be raised face except when bolted to flat face cast iron flange.
2. Bolting for services up to 500F shall be ASTM A307 Grade B with square head bolts and heavy hexagonal nuts conforming to ANSI B18.2.1 "Square and Hex Bolts" and B18.2.2 "Square and Hex Nuts".
3. Set flange bolts beyond finger tightness with a torque wrench for equal tension in all bolts. Tighten bolts so those 180 degrees apart are torqued in sequence.
4. Gaskets for flat face flanges shall be full face type. Gaskets for raised faced flanges shall conform to requirements for "Group I Gaskets" in ANSI B16.5. Unless otherwise specified gaskets shall meet the following requirements:
  - a. Gasket material and thickness approved by manufacturer for intended service, chemical compatibility, pipe system test pressure, and operating temperature range.
  - b. Maximum pressure rating of at least 250 psig
  - c. Minimum temperature rating: -10F.
  - d. Maximum temperature rating of at least 170F for water systems operating 140F and less.

C. Solder Joints (Copper Pipe):

1. Make up joints with 100% lead-free solder, ASTM B32. Cut tubing so ends are perfectly square and remove all burrs inside and outside. Thoroughly clean sockets of fittings and ends of tubing to remove all oxide, dirt and grease just prior to soldering. Apply flux evenly, but sparingly, over all surfaces to be joined. Heat joints uniformly so solder will flow to all mated surfaces. Wipe excess solder, leaving a uniform fillet around cup of fitting.
2. Flux shall be non-acid type.
3. Solder end valves may be installed directly in the piping system if the entire valve is suitable for use with 470F melting point solder. Remove discs and seals during soldering if they are not suitable for 470F.

D. Mechanical Press Connection (Copper and Stainless Steel Pipe):

1. Copper press fitting shall be made in accordance with the manufacturer's installation instructions.
2. Fully insert tubing into the fitting and mark tubing.
3. Prior to making connection, the fitting alignment shall be checked against the mark made on the tube to ensure the tubing is fully engaged in the fitting.
4. Joint shall be pressed with a tool approved by the manufacturer.
5. Installers shall be trained by manufacturer personnel or representative. Provide documentation upon request.

E. Hub and Spigot Joints - Sanitary Pipe and Storm Pipe (Cast Iron and Stainless Steel Pipe):

1. Lead and Oakum Joints: Pack joint with oakum made of vegetable fiber, cotton, or hemp. Pour joint with molten lead up to top of hub. Ensure leak-free joints by working joint with inside and outside caulking irons.
2. Compression Gasket Joints: Joint shall be one-piece double seal compression type gasket made specifically for joining cast iron soil pipe. Gasket shall be neoprene, permitting joint to flex as much as 5 degrees without loss of seal. Gasket shall be extra heavy weight class, conforming to ASTM C-564.

F. Solvent Weld Joints (PVC):

1. Make joints with a two-step process. Use primer conforming to ASTM F656 and solvent cement conforming to ASTM D2564.
2. All contractor personnel that will prepare solvent cemented joints shall be qualified for such bonding practices according to the bonding qualifications procedures described in ASME B31.3, Chapter VII for bonding of plastic piping.

G. Solvent Weld Joints (CPVC):

1. Make joints with a one-step process. Use CPVC cement conforming to ASTM F493. A primer is not required.
2. If a primer is required by the Authority Having Jurisdiction, then a primer conforming to ASTM F656 shall be used.
3. All contractor personnel that will prepare solvent cemented joints shall be qualified for such bonding practices according to the bonding qualifications procedures described in ASME B31.3, Chapter VII for bonding of plastic piping.

H. Couplings: Assemblies with combinations of clamps, gaskets, sleeves, and threaded or flanged parts; compatible with piping and system liquid; and made by piping manufacturer for joining system piping.

I. Adapters and Transition Fittings: Assemblies with combinations of clamps, couplings, adapters, gaskets, and threaded or flanged parts; compatible with piping and system liquid; and made for joining different piping materials.

J. Flanges: Assemblies of companion flanges and gaskets complying with ASME B16.21 and compatible with system liquid, and bolts and nuts.

END OF SECTION

## SECTION 22 10 30 - PLUMBING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Cleanouts.
- B. Traps.
- C. Trap Seals and Primers.
- D. Floor Drains and Sinks
- E. Hub Drains and Standpipes
- F. Strainers.
- G. Unions.
- H. Balancing Valves.
- I. Air Vents.

#### 1.2 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- B. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.

#### 1.3 REFERENCES

- A. ASSE 1010 - Water Hammer Arresters.
- B. PDI WH-201 - Water Hammer Arresters.

#### 1.4 SUBMITTALS

- A. Submit shop drawings under provisions of Section 22 05 00.
- B. Include sizes, rough-in requirements, service sizes, and finishes.

## PART 2 - PRODUCTS

### 2.1 CLEANOUTS

- A. Provide cleanouts as shown and specified on the drawings as well as required by code.
- B. Cleanouts on exposed pipes shall be cast iron with heavy duty cast brass plug with raised head.
- C. Cleanout shall be same size as the pipe up to 6" and 6" for larger pipes.

### 2.2 TRAPS

- A. Provide all individual connections to the sanitary system with P-traps, except where such drains discharge directly into a properly trapped collection basin or sump. Unless otherwise specified or shown, traps shall be of the same material as specified for waste system.
- B. All traps shall have accessible, removable cleanouts, except where installed on floor drains with removable strainers.
- C. Deep seal pattern traps shall be provided where required by code.
- D. Each trap shall be completely filled with water at the end of construction but before building turnover to the Owner. All floor drains, floor sinks, trench drains, etc. shall be filled with water.

### 2.3 STRAINERS

- A. Unless otherwise indicated, strainers shall be Y-pattern and have stainless steel screens with perforations as follows:
  - 1. Water:
    - a. 1/4" - 2": 3/64" perforations
    - b. 2-1/2" - 10": 1/16" perforations
    - c. 12" - 18": 1/8" perforations
- B. Furnish pipe nipple with shutoff valve to blow down all strainer screens.
- C. Use bronze body strainers in copper piping and iron body strainers in ferrous piping.

### 2.4 UNIONS

- A. Copper pipe - wrought copper fitting - ground joint.

## 2.5 AUTO-THERMOSTATIC ADJUSTABLE BALANCING VALVE

- A. Adjustable thermostatic balancing valve for domestic hot water recirculation circuits. Dry well with temperature gauge and probe. Internal thermostatic balancing cartridge automatically modulates flow to ensure constant temperature. Adjustable from 111F to 140F. Set temperature to 5F below system temperature.
- B. Sizes: 1/2" and 3/4" with NPT female connections. Flow rating: 2.1 Cv maximum, 0.23 Cv minimum, 0.52 Cv design. Suitable fluid: Water.
- C. Maximum working pressure: 230 psi. Maximum differential pressure: 15 psi. Maximum inlet temperature: 195F.
- D. Low-lead brass valve, stainless steel and copper adjustable thermostatic cartridge, EPDM hydraulic seals, stainless steel springs, adjustment knob with temperature adjustment scale, and tamperproof adjustment locking screw with probe dry-well port.
- E. Acceptable Manufacturers:
  - 1. Caleffi Thermosetter 116
  - 2. Kemper Multi-Therm 154-02
  - 3. Acorn TZV-1
  - 4. B&G Temp Setter

## 2.6 AUTO-THERMOSTATIC FIXED BALANCING VALVE

- A. Fixed thermostatic balancing valve for domestic hot water recirculation circuits. Internal thermostatic balancing cartridge automatically modulates flow to ensure constant temperature. Fixed preset temperature at 5F below system temperature.
- B. Sizes: 1/2", 3/4" and 1" with NPT female connections.
- C. Flow Rating:
  - 1. 1/2": Open Cv1.3; closed Cv0.2
  - 2. 3/4": Open Cv1.8; closed Cv0.2
  - 3. 1": Open Cv3.3; closed Cv0.2
- D. Maximum Working Pressure: 200 psi. Maximum Inlet Temperature: 250F.
- E. Low-lead brass valve, stainless steel thermostatic cartridge and spring.
- F. Acceptable Manufacturers:
  - 1. Circuit Solver CS

## 2.7 AIR VENTS

- A. Provide means for venting air at all high points in the piping system and at all other points where air may be trapped.
- B. At end of main and other points where large volume of air may be trapped - Use 1/4" globe valve, angle type, 125 psi, Crane #89, attached to coupling in top of main, 1/4" discharge pipe turned down with cap.

## PART 3 - EXECUTION

### 3.1 INSTALLATION AND APPLICATION

- A. Coordinate construction to receive drains at required invert elevations.
- B. Install all items per manufacturer's instructions.
- C. Cleanouts:
  - 1. Provide cleanouts at bases of all sanitary and storm risers as shown on the drawings and as required by code.
  - 2. Provide a cleanout at the upstream end of a horizontal waste pipe in a plumbing chase serving multiple plumbing fixtures; for example a bank of water closets or lavatories.
  - 3. Provide cleanouts on the branch line connected to individual plumbing fixtures as required by code; for example just below a sink, lavatory or urinal.
  - 4. Extend underfloor cleanouts up to the floor with long sweep elbows.
  - 5. Install a full size, two-way cleanout within 5 feet of the foundation inside of building.
  - 6. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with graphite and linseed oil. Ensure clearance at cleanouts for rodding of drainage system.
  - 7. Wall cleanouts shall be installed above the flow line of the pipe they serve, but no less than 12" above the finished floor.
- D. Hub Drains and Standpipes:
  - 1. The top of a hub drain/standpipe shall extend above the finished floor elevation. Refer to drawings for dimensions above the finished floor.
  - 2. Access shall be provided to drains and standpipes for rodding.

END OF SECTION

## SECTION 22 40 00 - PLUMBING FIXTURES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. All plumbing fixtures.

#### 1.2 REFERENCES

- A. ANSI A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
- B. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- C. ANSI A112.19.1M - Enameled Cast Iron Plumbing Fixtures.
- D. ANSI A112.19.2M - Vitreous China Plumbing Fixtures.
- E. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
- F. ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
- G. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
- H. ASSE 1002 - Water Closet Flush Tank Ball Cocks.
- I. Americans with Disabilities Act (ADA), Title III.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. All fixtures shall be as shown on the drawings and as scheduled in the plumbing material list. Additional requirements below:
- B. All vitreous china fixtures shall be from the same manufacturer where possible.
- C. All lavatory and sink trim shall be from the same manufacturer where possible.
- D. All fixtures shall be lead free. Faucets, traps, stops, and other fixture accessories shall not contain more lead than allowed per the latest State or Federal Act.
- E. P-Traps and Tailpieces:
  - 1. Lavatories:

- 
- a. Accessible Type: 1-1/4" chrome plated 17-gauge cast brass offset tailpiece and p-trap with cleanout on bottom of trap.
  - b. Non-Accessible Type: Offset not required for tailpiece, otherwise same.
2. Sinks:
    - a. Accessible Type: 1-1/2" chrome plated 17-gauge cast brass offset tailpiece and p-trap with cleanout on bottom of trap.
    - b. Non-Accessible Type: Offset not required for tailpiece, otherwise same.
- F. Insulation Covers and Enclosures for Accessible Lavatories and Sinks:
1. Premanufactured cover for P-trap, stop valves, and supply lines.
    - a. 1/8" thick vinyl construction, paintable, tool free installation,
  2. Premanufactured rigid enclosure for concealing lavatory P-trap, stop valves, and supply lines,
    - a. Rigid, high impact PVC, paintable, stainless steel fasteners for anchoring and removal.
  3. Premanufactured rigid enclosure for concealing sink P-trap, stop valves, supply lines, garbage disposal, etc.
    - a. Rigid, high impact PVC, white or beige (Color by architect), paintable, 36" or 42" widths, stainless steel fasteners for anchoring and removal.
- G. Wall Hung Fixture Carriers:
1. Material: All Metal, ASME/ANSI A112.6.1M.
  2. Lavatory carrier shall be rated to support 250 lbs unless noted otherwise on the drawings.
  3. Water closet carrier shall be rated to support 500 lbs unless noted otherwise on the drawings

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General Installation Requirements:
1. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
  2. Install each fixture with trap easily removable for servicing and cleaning. Use screwed tailpiece couplings. Connect fixture waste to stack with slip fitting.

3. Provide fixtures with supply lines, stop valves, reducers, escutcheons, and any other items required for a complete and operational plumbing fixture assembly.
4. Install components level and plumb.
5. Caulk joint between finish floor and floor mounted fixtures and between finish walls and wall mounted fixtures with silicon caulk. Caulk the joint, between rim and fixture where a fixture builds into a counter top, with caulking compound.
6. Where there is a possibility of water following pipe brackets, etc., into a wall; caulk escutcheons, space around brackets, etc., to exclude water.
7. Refer to architectural drawings for fixture mounting heights.
8. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.

B. Wall-Mounted Fixture Requirements:

1. All wall-mounted fixtures shall have compatible carriers designed for their intended service and suitable for the space available and configuration of fixtures. All carriers shall extend to the floor and be anchored to the slab as intended by the carrier manufacturer.

C. Floor-Mounted Fixture Requirements:

1. Where floor mounted fixtures are installed on a sloped floor, the open void below the fixture shall be grouted, leveled, and caulked to eliminate stress on the fixture and to prevent water migration to the floor below.

D. Exposed or Inside Accessible Cabinets Traps, Valve and Pipe Requirements:

1. All water or waste piping for plumbing fixtures that is exposed or inside cabinets shall be chrome plated.
2. All exposed flush valves for water closets and urinals shall have a chrome plated hanger to anchor the piping to the wall.
3. All exposed water supply piping and fittings in a finished space to a shower valve, hose bibb, or other water outlet shall be chrome plated.

E. ADA Accessible Exposed Sink and Lavatory Trim:

1. All exposed sink and lavatory traps, piping and angle stops installed at accessible sink and lavatory locations shall include offset style drain tailpiece, p-trap installed near and parallel with back wall, and insulation kit specially manufactured for this installation. Armaflex with duct tape is not acceptable.

F. ADA Accessible Water Closet Requirements:

1. Handicapped accessible water closet flush valve or flush tank handles shall be on the left hand or right hand side of the fixture, whichever is nearer to the center of the stall.

2. Coordinate flush valves in handicap accessible locations with grab bars installed by the General Contractor. Make modifications as necessary to flush valve piping to avoid conflict with grab bars. Common solutions include shortened or offset vacuum breaker tailpieces.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B. At completion, clean plumbing fixtures, equipment, and faucet aerator screens.

END OF SECTION

## SECTION 26 05 00 - BASIC ELECTRICAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Requirements applicable to all Division 26 Sections. This section is also applicable to Fire Alarm and Detection Systems Section 28 31 02.
- B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

#### 1.2 REFERENCES

- A. NFPA 70 - National Electrical Code (NEC)

#### 1.3 SCOPE OF WORK

- A. This Specification and the associated drawings govern furnishing, installing, testing and placing into satisfactory operation the Electrical Systems.
- B. The Contractor shall furnish and install all new materials as indicated on the drawings, and/or in these specifications, and all items required to make the portion of the Electrical Work a finished and working system.
- C. Separate contracts will be awarded for the following work.
- D. All work will be awarded under a single General Contract. The division of work listed below is for the Contractor's convenience and lists normal breakdown of the work.
- E. Separate contracts will be awarded. The division of work is for the contractors' convenience and lists a normal breakdown of the work. Please refer to the Construction Manager's scope statements for complete scope of work description.

#### 1.4 WORK SEQUENCE

- A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours are required.

1.5 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL, and CONTROL CONTRACTORS

- A. Division of work is the responsibility of the Prime Contractor. Any scope of work described at any location on the contract document shall be sufficient for including said requirement in the project. The Prime Contractor shall be solely responsible for determining the appropriate subcontractor for the described scope. In no case shall the project be assessed an additional cost for scope that is described on the contract documents on bid day. The following division of responsibility is a guideline based on typical industry practice.
- B. Definitions:
1. "Mechanical Contractors" refers to the Contractors listed in Division 22 of this Specification.
  2. "Technology Contractors" refers to the Contractors furnishing and installing systems listed in Division 28 of this Specification.
  3. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
  4. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring that directly powers or controls a motor used to drive equipment such as fans, pumps, etc. This wiring will be from a 120-volt source and may continue as 120 volt, or be reduced in voltage (24 volt), in which case a control transformer shall be furnished as part of the temperature control wiring.
  5. Low Voltage Technology Wiring: The wiring associated with the technology systems, used for analog or digital signals between equipment.
  6. Telecommunications/Technology Rough-in: Relates specifically to the backboxes, necessary plaster rings and other miscellaneous hardware required for the installation or mounting of telecommunications/technology information outlets.
- C. General:
1. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall furnish complete wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
  2. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 22 and 23. Materials and installation to conform to Class 1 or 2 requirements.
  3. The Electrical Contractor shall establish electrical utility elevations prior to fabrication and installation. The Electrical Contractor shall coordinate utility elevations with other trades. When a conflict arises, priority shall be as follows:

- a. Luminaires.
- b. Gravity flow piping, including steam and condensate.
- c. Sheet metal.
- d. Cable trays, including access space.
- e. Other piping.
- f. Conduits and wireway.

D. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment furnished by the Mechanical Contractor.
2. Assumes all responsibility for miscellaneous items furnished by the Mechanical Contractor that require wiring but are not shown on the electrical drawings or specified in the Electrical Specification. If items such as relays, flow switches, or interlocks are required to make the mechanical system function correctly or are required by the manufacturer, they are the responsibility of the Mechanical Contractor.
3. Assumes all responsibility for Temperature Control wiring, if the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
4. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

E. Temperature Control Contractor's or Subcontractor's Responsibility:

1. Wiring of all devices needed to make the Temperature Control System functional.
2. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Contractor or Subcontractor.
3. Coordinating equipment locations (such as PE's, EP's, relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.

F. Electrical Contractor's Responsibility:

1. Furnishes and installs all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor in the Mechanical Drawings or Specifications.
2. Installs and wires all remote-control devices furnished by the Mechanical Contractor or Temperature Control Contractor when so noted on the Electrical Drawings.
3. Furnishes and installs motor control and temperature control wiring, when noted on the drawings.
4. Furnishes, installs, and connects all relays, etc., for automatic shutdown of certain mechanical equipment (supply fans, exhaust fans, etc.) upon actuation of the Fire Alarm System.
5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

G. General (Electrical/Technology):

1. "Electrical Contractor" as referred to herein shall be responsible for scope listed in Division 28 of this specification when the "Suggested Matrix of Scope Responsibility" indicated work shall be furnished and installed by the EC. Refer to the Contract Documents for this "Suggested Matrix of Scope Responsibility".
2. The purpose of these Specifications is to outline the Electrical and Technology Contractor's work responsibilities as related to Telecommunications Rough-in, conduit, cable tray, power wiring and Low Voltage Technology Wiring.
3. The exact wiring requirements for much of the equipment cannot be determined until the systems have been purchased and submittals approved. Therefore, only known wiring, conduits, raceways and electrical power related to such items is shown on the Technology drawings. Other wiring, conduits, raceways, junction boxes and electrical power not shown on the Technology Drawings but required for operation of the systems is the responsibility of the Technology Contractor and included in said Contractor's bid.
4. Where the Electrical Contractor is required to install conduit, conduit sleeves and/or power connections in support of Technology systems, the final installation shall not be until a coordination meeting between the Electrical Contractor and the Technology Contractor has convened to determine the exact location and requirements of the installation.
5. Where the Electrical Contractor is required to install cable tray that will contain Low Voltage Technology Wiring, installation shall not begin prior to a coordination review of the cable tray shop drawings by the Technology Contractor.

H. Technology Contractor's Responsibility:

1. Assumes all responsibility for the low voltage technology wiring of all systems, including cable support where open cable is specified.
2. Assumes all responsibility for all required backboxes, conduit and power connections not specifically shown as being furnished and installed by the Electrical Contractor on the "Suggested Matrix of Scope Responsibility".
3. Assumes all responsibility for providing and installing all ladder rack and other cable management hardware (as defined herein).
4. Responsible for providing the Electrical Contractor with the required grounding lugs or other hardware for each piece of technology equipment which is required to be bonded to the telecommunications ground bar.
5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.6 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing/Bid Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guides, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Architect/Engineer any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Architect/Engineer will be done at the Contractor's risk.

B. Qualifications:

1. Only products of reputable manufacturers as determined by the Architect/Engineer are acceptable.
2. All Contractors and subcontractors shall employ only workmen who are skilled in their trades. At all times, the number of apprentices at the job site shall be less than or equal to the number of journeymen at the job site.

C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the State of Michigan Codes, Laws, Ordinances and other regulations having jurisdiction.
2. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
3. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
4. All changes to the system made after the letting of the contract to comply with codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.
5. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
6. If there are no local codes having jurisdiction, the current issue of the National Electrical Code shall be followed.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.

2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriter's Laboratories, Inc. or a nationally recognized testing organization.

E. Examination of Drawings:

1. The drawings for the electrical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of raceways to best fit the layout of the job. Conduit entry points for electrical equipment including, but not limited to, panelboards, switchboards, switchgear and unit substations, shall be determined by the Contractor unless noted in the contract documents.
3. Scaling of the drawings will not be sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as junction boxes, pull boxes, conduit fittings, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either shown on the drawings or called for in the specifications, it shall be included in this contract.
7. The Contractor shall determine quantities and quality of material and equipment required from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater and better-quality number shall govern.
8. Where used in electrical documents the word "furnish" shall mean supply for use, the word "install" shall mean connect up complete and ready for operation, and the word "provide" shall mean to supply for use and connect up complete and ready for operation.
9. Any item listed as furnished shall also be installed unless otherwise noted.
10. Any item listed as installed shall also be furnished unless otherwise noted.

F. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any conduit, conductors, wireways, bus duct, fittings, etc.

## 1.7 SUBMITTALS

- A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

Referenced Specification Section	Submittal Item
26 05 03	Through Penetration Firestopping
26 05 13	Wire and Cable
26 05 26	Grounding and Bonding
26 05 33	Conduit and Boxes
26 05 36	Cable Trays
26 05 53	Electrical Identification
26 09 33	Lighting Control System
26 27 26	Wiring Devices
26 51 00	Lighting
26 51 19	LED Lighting
28 31 00	Fire Alarm and Detection Systems
28 31 50	Air Sampling Smoke Detection System

- B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:

- a. Date
- b. Project title and number
- c. Contractor's name and address
- d. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
- e. Description of items submitted and relevant specification number
- f. Notations of deviations from the contract documents
- g. Other pertinent data

2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

- a. Date
- b. Project title and number
- c. Architect/Engineer
- d. Contractor and subcontractors' names and addresses
- e. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
- f. Description of item submitted (using project nomenclature) and relevant specification number
- g. Notations of deviations from the contract documents
- h. Other pertinent data

- 
- i. Provide space for Contractor's review stamps
3. Composition:
    - a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
    - b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
    - c. All sets shall contain an index of the items enclosed with a general topic description on the cover.
  4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
  5. Contractor's Approval Stamp:
    - a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
    - b. Unstamped submittals will be rejected.
    - c. The Contractor's review shall include, but not be limited to, verification of the following:
      - 1) Only approved manufacturers are used.
      - 2) Addenda items have been incorporated.
      - 3) Catalog numbers and options match those specified.
      - 4) Performance data matches that specified.
      - 5) Electrical characteristics and loads match those specified.
      - 6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
      - 7) Dimensions and service clearances are suitable for the intended location.
      - 8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
      - 9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).
    - d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.

- e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.
6. Submittal Identification and Markings:
    - a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
    - b. The Contractor shall clearly indicate the size, finish, material, etc.
    - c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
    - d. All marks and identifications on the submittals shall be unambiguous.
  7. Schedule submittals to expedite the project. Coordinate submission of related items.
  8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
  9. Reproduction of contract documents alone is not acceptable for submittals.
  10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
  11. Submittals not required by the contract documents may be returned without review.
  12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
  13. Submittals shall be reviewed and approved by the Architect/Engineer before releasing any equipment for manufacture or shipment.
  14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.
  15. Schedule shall allow for adequate time to perform orderly and proper review of submittals, including time for consultants and Owner if required, and resubmittals by Contractor if necessary, and to cause no delay in Work or in activities of Owner or other contractors.
    - a. Allow at least two weeks for Architect's/Engineer's review and processing of each submittal, excluding mailing.
  16. Architect/Engineer reserves the right to withhold action on a submittal which, in the Architect/Engineer's opinion, requires coordination with other submittals until related submittals are received. The Architect/Engineer will notify the Contractor, in writing, when they exercise this right.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
  - a. Submittal file name: 26 XX XX.description.YYYYMMDD
  - b. Transmittal file name: 26 XX XX.description.YYYYMMDD
5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

#### 1.8 CHANGE ORDERS

- A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders shall be broken down by sheet or associated individual line item indicated in the change associated narrative, whichever provides the most detailed breakdown. Change orders with inadequate breakdown will be rejected.
- B. Itemized pricing with unit cost shall be provided from all distributors and associated subcontractors.
- C. Change order work shall not proceed until authorized.

#### 1.9 PRODUCT DELIVERY, STORAGE, HANDLING and MAINTENANCE

- A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage.
- B. Protect equipment, components, and openings with airtight covers and exercise care at every stage of storage, handling, and installation of equipment to prevent airborne dust and dirt from entering or fouling equipment to include, but not limited to:
  1. Distribution equipment - branch panels, distribution panels, switchboards, motor control centers, etc.
  2. Variable frequency drives.
  3. Transformers, ventilated.
  4. Electronic equipment, UPS, harmonic filters, power factor correction.
  5. Lighting luminaires and lighting control systems.

- C. Equipment and components that are visibly damaged or have been subject to environmental conditions prior to building turnover to Owner that could shorten the life of the component (for example, water damage, humidity, dust and debris, excessive hot or cold storage location, etc.) shall be repaired or replaced with new equipment or components without additional cost to the building owner.
- D. Keep all materials clean, dry and free from damaging environments.
- E. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Electrical Contractor does not have prior documented experience in rigging and lifting similar equipment, they shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.
- F. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

#### 1.10 NETWORK / INTERNET CONNECTED EQUIPMENT

- A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.
- B. The following network connected equipment shall be equipped with restricted access protocols:
  - 1. Adjustable trip overcurrent protection devices
  - 2. Power monitoring and control
  - 3. Electrical controls
  - 4. Lighting control system
  - 5. Variable frequency drives
  - 6. Package engine generator and remote annunciator
  - 7. Transfer switch and remote annunciator
  - 8. Static uninterruptible power supply (UPS)
  - 9. Fire alarm and automatic detection

#### 1.11 WARRANTY

- A. Provide one-year warranty for all fixtures, equipment, materials, and workmanship.

- B. The warranty period for all work in this specification Division shall commence on the date of Substantial Completion or successful system performance whichever occurs later. The warranty may also commence if a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization of the Owner. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.
- C. Warranty requirements extend to correction, without cost to the Owner, of all work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage due to defects or nonconformance with contract documents excluding repairs required as a result of improper maintenance or operation, or of normal wear as determined by the Architect/Engineer.

#### 1.12 MATERIAL SUBSTITUTION

- A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis for job design and establishes the quality.
- B. Equivalent equipment manufactured by the other listed manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space. When using other listed manufacturers, the Contractor shall assume responsibility for any and all modifications necessary (including, but not limited to structural supports, electrical connections and rough-in, and regulatory agency approval, etc.) and coordinate such with other contractors. The Architect/Engineer shall make the final determination of whether a product is equivalent.
- C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer via addendum. The Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractors part or on the part of other Contractors whose work is affected.
- D. Voluntary add or deduct prices for alternate materials may be listed on the bid form. These items will not be used in determining the low bidder. This Contractor assumes all costs incurred as a result of using the offered material or equipment on the Contractors part or on the part of other Contractors whose work is affected.
- E. All material substitutions requested after the final addendum must be listed as voluntary changes on the bid form.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. All items of material having a similar function (e.g., safety switches, panelboards, switchboards, contactors, motor starters, dry type transformers) shall be of the same manufacturer unless specifically stated otherwise on drawings or elsewhere in specifications.

## PART 3 - EXECUTION

### 3.1 JOBSITE SAFETY

- A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

### 3.2 ARCHITECT/ENGINEER OBSERVATION OF WORK

- A. The contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:
  - 1. Covering exterior walls, interior partitions and chases.
  - 2. Installing hard or suspended ceilings and soffits.
- B. The Architect/Engineer will review the installation and provide a written report noting deficiencies requiring correction. The contractor's schedule shall account for these reviews and show them as line items in the approved schedule.
- C. Above-Ceiling Final Observation:
  - 1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:
    - a. All junction boxes are closed and identified in accordance with Section 26 05 53 Electrical Identification.
    - b. Luminaires, including ceiling-mounted exit and emergency lights, are installed and operational.
    - c. Luminaire whips are supported above the ceiling.

- d. Conduit identification is installed in accordance with Section 26 05 53 Electrical Identification.
  - e. Luminaires are suspended independently of the ceiling system when required by these contract documents.
  - f. All wall penetrations have been sealed.
2. To prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
  3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to seven days elapsing, the Architect/Engineer may not recommend further payments to the contractor until full access has been provided.

### 3.3 PROJECT CLOSEOUT

#### A. Final Jobsite Observation:

1. To prevent the Final Jobsite Observation from occurring too early, the Contractor shall review the completion status of the project and certify that the job is ready for the final jobsite observation.
2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review. The Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
3. It is understood that if the Architect/Engineer finds the job not ready for the final observation and additional trips and observations are required to bring the project to completion, the cost of the additional time and expenses incurred by the Architect/Engineer will be deducted from the Contractor's final payment.
4. Contractor shall notify Architect/Engineer 48 hours prior to installation of ceilings or lay-in ceiling tiles.

#### B. The following must be submitted before Architect/Engineer recommends final payment:

1. Operation and maintenance manuals with copies of approved shop drawings.
2. Record documents including marked-up drawings and specifications.
3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of this Contractor and shall be signed by the Owner's representatives.
4. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed and submit receipt to Architect/Engineer.
5. Inspection and testing report by the fire alarm system manufacturer.
6. Start-up reports on all equipment requiring a factory installation or start-up.

#### C. Circuit Directories:

1. Provide custom typed circuit directory for each branch circuit panelboard. Provide updated custom typed circuit directory for each existing branch circuit panelboard with new or revised circuits per the scope of work. Label shall include equipment name or final approved room name, room number, and load type for each circuit (examples: SUMP SP-1 or ROOM 101 RECEIPT). Revise directory to reflect circuit changes required to balance phase loads. Printed copies of the bid document panel schedules are not acceptable as circuit directories.

### 3.4 OPERATION AND MAINTENANCE MANUALS

#### A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

#### B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
  - a. O&M file name: O&M.div26.contractor.YYYYMMDD
  - b. Transmittal file name: O&Mtransmittal.div26.contractor.YYYYMMDD
5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copies of all factory inspections and/or equipment startup reports.
5. Copies of warranties.
6. Schematic wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
7. Dimensional drawings of equipment.
8. Detailed parts lists with lists of suppliers.
9. Operating procedures for each system.
10. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
11. Repair procedures for major components.
12. Replacement parts and service material requirements for each system and the frequency of service required.
13. Instruction books, cards, and manuals furnished with the equipment.

3.5 RECORD DOCUMENTS

- A. Maintain at the job site a separate and complete set of electrical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.
- B. Mark drawings and specifications to indicate approved substitutions; Change Orders, and actual equipment and materials used. All Change Orders, RFI responses, Clarifications and other supplemental instructions shall be marked on the documents. Record documents that merely reference the existence of the above items are not acceptable. Should this Contractor fail to complete Record Documents as required by this contract, this Contractor shall reimburse Architect/Engineer for all costs to develop record documents that comply with this requirement. Reimbursement shall be made at the Architect/Engineer's hourly rates in effect at the time of work.
- C. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.
- D. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

### 3.6 ADJUST AND CLEAN

- A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project.
- B. Clean all foreign paint, grease, oil, dirt, labels, stickers, etc. from all equipment.
- C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

### 3.7 SPECIAL REQUIREMENTS

- A. Coordinate the installation of all equipment, controls, devices, etc., with other trades to maintain clear access area for servicing.
- B. Install all equipment to maximize access to parts needing service or maintenance. Review the final location, placement, and orientation of equipment with the Owner's representative prior to setting equipment.
- C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's representative will result in removal and reinstallation of the equipment at the Contractor's expense.

### 3.8 INDOOR AIR QUALITY (IAQ) MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

- A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:
  - 1. General Contractor shall erect and maintain dust barriers throughout the construction work. These barriers shall be reasonably airtight and shall prevent entry into the construction zone by unauthorized persons. Reasonably airtight means construction equivalent to full-height temporary or permanent walls with joints taped or sealed, and shafts and other penetrations sealed as well as possible. Fire resistant polyethylene is acceptable; if flame spread/smoke developed ratings are demonstrated to conform to the applicable building codes and licensing acts.
  - 2. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:
    - a. Minimizing the amount of dust generated.
    - b. Reducing solvent fumes and VOC emissions.
    - c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
  - 3. Request that the Owner designate an IAQ representative.
  - 4. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.

5. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
6. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
7. Request copies of and follow all Owner's IAQ and infection control policies.
8. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
9. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
10. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings under Construction".

### 3.9 FIELD QUALITY CONTROL

#### A. General:

1. Conduct all tests required during and after construction. Submit test results in NETA format, or equivalent form, that shows the test equipment used, calibration date, tester's name, ambient test conditions, humidity, conductor length, and results corrected to 40°C.
2. Supply necessary instruments, meters, etc., for the tests. Supply competent technicians with training in the proper testing techniques.
3. All cables and wires shall be tested for shorts and grounds following installation and connection to devices. Replace shorted or grounded wires and cables.
4. Any wiring device, electrical apparatus or luminaire, if grounded or shorted on any integral "live" part, shall have all defective parts or materials replaced.
5. Test cable insulation of service and panel feeder conductors for proper insulation values. Tests shall include the cable, all splices, and all terminations. Each conductor shall be tested and shall test free of short circuits and grounds and have an insulation value not less than Electrical Code Standards. Take readings between conductors, and between conductors and ground.
6. If the results obtained in the tests are not satisfactory, make adjustments, replacements, and changes as needed. Then repeat the tests, and make additional tests, as the Architect/Engineer or authority having jurisdiction deems necessary.

#### B. Ground Resistance:

1. Conduct service ground resistance tests using an approved manufactured ground resistance meter. Submit to the Architect/Engineer a proposed test procedure including type of equipment to be used. (The conventional ohmmeter is not an acceptable device.)
2. Make ground resistance measurements during normal dry weather and not less than 48 hours after a rain.

#### C. Ground-Fault Equipment Performance Testing:

1. Test: Perform ground-fault performance testing when system is installed. The test process shall use primary current injection per manufacturer instruction and procedures. Perform test for the following:

- a. Service disconnects
    - b. Solid state molded case circuit breakers and solid-state insulated case circuit breakers equipped with ground fault protection.
    - c. Fusible switches with ground fault relay protection.
    - d. Outside branch circuits and feeders.
    - e. Code required.
  2. Report: Provide copy of test result report with Operation and Maintenance manuals. Provide report to Authority Having Jurisdiction when requested.
- D. Arc Energy Reduction Equipment Performance Testing:
1. Test: Perform arc energy protection performance testing when system is installed. The test process shall use primary current injection or approved method per manufacturer instructions and procedures. Perform test for the following:
    - a. All arc energy reduction systems installed.
  2. Report: Provide copy of test result report with Operation and Maintenance manuals. Provide report to Authority Having Jurisdiction when requested.
- E. If any test results are not satisfactory, make adjustments, replacements and changes as needed and repeat the tests and make additional tests as the Architect/Engineer or authority having jurisdiction deem necessary.

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READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to requesting a final job observation.

1. Penetrations of fire-rated construction fire sealed in accordance with specifications.
2. Electrical panels have typed circuit identification.
3. Smoke and fire/smoke dampers are wired and have been tested.
4. Per Section 26 05 00, cable insulation test results have been submitted.
5. Per Section 26 05 00, medium voltage testing report has been submitted.
6. Per Section 26 05 00, ground resistance test results have been submitted.
7. Operation and Maintenance manuals have been submitted as per Section 26 05 00.
8. Bound copies of approved shop drawings have been submitted as per Section 26 05 00.
9. Report of instruction of Owner's representative has been submitted as per Section 26 05 00.
10. Fire alarm inspection and testing report has been submitted as per Sections 26 05 00 and 28 31 02.
11. Start-up reports from factory representative have been submitted as per Section 26 05 00.

Accepted by:

Prime Contractor \_\_\_\_\_

By \_\_\_\_\_ Date \_\_\_\_\_

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION

## SECTION 26 05 03 - THROUGH PENETRATION FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Through-Penetration Firestopping.

#### 1.2 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.
- B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

#### 1.3 REFERENCES

- A. UL 263 - Fire Tests of Building Construction and Materials
- B. UL 723 - Surface Burning Characteristics of Building Materials
- C. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops
- D. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)
- E. Intertek / Warnock Hersey - Directory of Listed Products
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- G. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops
- H. 2021 International Building Code
- I. NFPA 5000 - Building Construction Safety Code

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 26 05 00.
- B. Submit Firestopping Installers Certification for all installers on the project.
- C. Shop Drawings: Submit for each condition requiring firestopping. Include descriptions of the specific penetrating item, actual wall/floor construction, manufacturer's installation instructions, and UL or Interek / Warnock Hersey Assembly number.

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- D. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
1. Types of penetrating items.
  2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
  3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
  4. F ratings for each firestop system.
- E. Maintain a notebook on the job site at all times that contains copies of approved submittals for all through penetration firestopping to be installed. Notebook shall be made available to the Authority Having Jurisdiction at their request and turned over to the Owner at the end of construction as part of the O&M Manuals.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.
- B. Install material prior to expiration of product shelf life.

#### 1.6 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.
  2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
  2. L-Rated Systems: Provide through-penetration firestop systems with L-ratings of not more than 5.0 CFM/sq.ft. at both ambient temperature and 400F .

- C. For through-penetration firestop systems exposed to light, traffic, moisture, or physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. For through-penetration firestop systems in air plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

#### 1.7 WARRANTY

- A. Provide one year warranty on parts and labor.
- B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, general durability, or appear to deteriorate in any manner not clearly specified by the manufacturer as an inherent quality of the material.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers. All firestopping systems installed shall be provided by a single manufacturer.
  - 1. 3M; Fire Protection Products Division
  - 2. Hilti, Inc.
  - 3. RectorSeal Corporation, Metacaulk
  - 4. Tremco; Sealant/Weatherproofing Division
  - 5. Johns-Manville
  - 6. Specified Technologies Inc. (S.T.I.)
  - 7. Spec Seal Firestop Products
  - 8. AD Firebarrier Protection Systems
  - 9. Wiremold/Legrand: FlameStopper
  - 10. Dow Corning Corp.
  - 11. Fire Trak Corp.
  - 12. International Protective Coating Corp.
  - 13. HoldRite

## 2.2 THROUGH PENETRATION FIRESTOP SYSTEMS

- A. Provide materials and systems classified by or listed by Intertek / Warnock Hersey to provide firestopping equal to time rating of construction being penetrated.
- B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that would require hazardous waste removal.
- C. Firestopping shall be flexible to allow for normal penetrating item movement due to expansion and contraction.
- D. Provide firestopping systems capable of supporting floor loads where systems are exposed to possible floor loading or traffic.
- E. Provide firestopping systems classified by UL or listed by Intertek / Warnock Hersey for penetrations through all fire rated construction. Firestopping systems shall be selected from the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory Category XHEZ based on substrate construction and penetrating item size and material and shall fall within the range of numbers listed:

### 1. Combustible Framed Floors and Chase Walls - 1 or 2 Hour Rated:

- a. F Rating = Floor/Wall Rating
- b. L Rating = Penetrations in Smoke Barriers

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	FC 0000-0999*
Metallic Pipe or Conduit	FC 1000-1999
Non-Metallic Pipe or Conduit	FC 2000-2999
Electrical Cables	FC 3000-3999
Cable Trays	FC 4000-4999
Insulated Pipes	FC 5000-5999
Bus Duct and Misc. Electrical	FC 6000-6999
Duct without Damper and Misc. Mechanical	FC 7000-7999
Multiple Penetrations	FC 8000-8999

\*Alternate method of firestopping is patching opening to match original rated construction.

### 2. Non-Combustible Framed Walls - 1 or 2 Hour Rated:

- a. F Rating = Wall Rating
- b. L Rating = Penetrations in Smoke Barriers

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999

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<u>Penetrating Item</u>	<u>UL System No.</u>
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL 6000-6999
Duct without Damper and Misc. Mechanical	WL 7000-7999
Multiple Penetrations	WL 8000-8999
*Alternate method of firestopping is patching opening to match original rated construction.	

3. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated:

- a. F Rating = Wall/Floor Rating
- b. L Rating = Penetrations in Smoke Barriers

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Cable Trays	CAJ 4000-4999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ 6000-6999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999
*Alternate method of firestopping is patching opening to match original rated construction.	

- F. Any opening in walls or floors not covered by the listed series of numbers shall be coordinated with the firestopping manufacturer.
- G. Any openings in floors or walls not described in the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having Jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose materials. Clean and repair surfaces as required. Remove laitance and form-release agents from concrete.

- B. Ensure substrate and penetrating items have been permanently installed prior to installing firestopping systems. Ensure penetrating items have been properly spaced and have proper clearance prior to installing firestopping systems.
- C. Surfaces to which sealing materials are to be installed must meet the selected UL or Intertek / Warnock Hersey system substrate criteria.
- D. Prime substrates where recommended in writing by through-penetration firestop system manufacturer. Confine primer to area of bond.

### 3.2 INSTALLATION

- A. In existing construction, provide firestopping of openings prior to and after installation of penetrating items. Remove any existing coatings on surfaces prior to firestopping installation. Temporary firestopping shall consist of packing openings with fire resistant mineral wool for the full thickness of substrate, or an alternate method approved by the Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately upon their installation and shall remain so until the permanent UL or listed by Intertek / Warnock Hersey listed firestopping system is installed.
- B. Install penetration seal materials in accordance with printed instructions of the UL or Intertek / Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application instructions.
- C. Install dams as required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Remove combustible damming after appropriate curing.

### 3.3 CLEANING AND PROTECTING

- A. Clean excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not cause damage.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

### 3.4 INSPECTION

- A. All penetrations shall be inspected by the manufacturer's representative to ensure proper installation.
- B. Access to firestop systems shall be maintained for examination by the Authority Having Jurisdiction at their request.

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P24010\_002 DTW ADA  
IMPROVEMENTS, ADULT  
CHANGING ROOMS AND BABY  
CHANGING COUNTERS  
Romulus, Michigan

P24010-002

IFB Set  
09-12-2025

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- C. Proceed with enclosing through-penetration firestop system with other construction only after inspection reports are issued and firestop installations comply with requirements.

END OF SECTION



## SECTION 26 05 05 - ELECTRICAL DEMOLITION FOR REMODELING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Electrical demolition

### PART 2 - PRODUCTS

#### 2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work shall be as specified in individual Sections.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY BOX, CONDUIT, OR WIRE THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS.
- B. Where walls, ceilings, structures, etc., are indicated as being removed on general or electrical drawings, the Contractor shall be responsible for the removal of all electrical equipment, devices, fixtures, raceways, wiring, systems, etc., from the removed area.
- C. Where ceilings, walls, structures, etc., are temporarily removed and replaced by others, this Contractor shall be responsible for the removal, storage, and replacement of equipment, devices, fixtures, raceways, wiring, systems, etc.
- D. Where mechanical or technology equipment is indicated as being removed on electrical, mechanical, or technology drawings, the Contractor shall be responsible for disconnecting the equipment and removing all starters, VFD, controllers, electrical equipment, raceways, wiring, etc. associated with the device.
- E. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to facilities and equipment that will remain in operation following demolition. Extension of conduit and wire to equipment shall be compatible with the surrounding area. Extended conduit and conductors to match existing size and material.
- F. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and electrical service to avoid conflicts.

- G. Bid submittal shall mean the Contractor has visited the project site and has verified existing conditions and scope of work.

### 3.2 PREPARATION

- A. The Contractor shall obtain approval from the Owner before turning off power to circuits, feeders, panels, etc. Coordinate all outages with Owner.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations. Assume all equipment and systems must remain operational unless specifically noted otherwise on drawings.
- C. Disconnect electrical systems in walls, floors, structures, and ceilings scheduled for removal.
- D. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area. Provide a watchman to make required premise observations during all outages, requirements as dictated by codes and Owner's insurance carrier.

### 3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring and raceway to source of supply. Existing conduit in good condition may be reused in place by including an equipment ground conductor in reused conduit. Reused conduit and boxes shall have supports revised to meet current codes. Relocating conduit shall not be allowed.
- C. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.
- D. Disconnect and remove outlets and devices that are to be demolished. Unless otherwise noted, remove outlet or devices' associated back box, supports, and conduit and conductors back to source. Patch opening created from removal of device to match surrounding finishes. Where noted, remove conduit, supports, and conductors back to source. Devices' back box and conduit mounted in walls that are to remain can be abandoned in place. Provide appropriate cover plate for all abandoned back boxes. Cover plates shall match existing plates used in the adjacent areas.
- E. Disconnect and remove electrical devices and equipment serving equipment that has been removed.

- F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories. Ballasts in light fixtures installed prior to 1980 shall be incinerated in EPA approved incinerator or disposed of in EPA certified containers and deposited in an EPA landfill certified for PCB disposal or recycled by permitted ballast recycler. Punctured or leaking ballasts must be disposed of according to Federal Regulations under the Toxic Substance Control Act. Provide Owner and Architect/Engineer with a Certificate of Destruction to verify proper disposal.
- G. Repair adjacent construction and finishes damaged during demolition and extension work. Patch openings to match existing surrounding finishes.
- H. Maintain access to existing electrical installations that remain active. Modify installation or provide junction boxes and access panel as appropriate.
- I. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified. Extended conduit and conductors to match existing size and material.
- J. HID and fluorescent lamps, determined by the Toxicity Characteristic Leachate procedure (TCLP), to be hazardous waste shall be disposed of in an EPA-permitted hazardous waste disposal facility or by a permitted lamp recycler.
- K. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- L. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

### 3.4 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or are to be reused.
- B. Luminaires: Remove existing luminaires for cleaning as indicated on the drawings. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts. Replacement parts shall match specified components for new luminaires of same type when applicable. Reinstall luminaire and connect to circuiting as indicated on drawings.
- C. ELECTRICAL ITEMS (E.G., LIGHTING FIXTURES, RECEPTACLES, SWITCHES, CONDUIT, WIRE, ETC.) REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF MATERIAL THE OWNER DOES NOT WANT.

END OF SECTION



## SECTION 26 05 13 - WIRE AND CABLE

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Building Wire - Copper
- B. Cabling for remote control, signal, and power limited circuits
- C. Armored cable (AC)
- D. Metal-clad cable (MC)

#### 1.2 RELATED WORK

- A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

#### 1.3 REFERENCES

- A. NEMA WC 70 - Power Cables Rated 2,000V or Less for the Distribution of Electrical Energy
- B. NFPA 70 - National Electrical Code (NEC)
- C. UL 44 - Thermoset-Insulated Wires and Cables
- D. UL 83 - Thermoplastic-Insulated Wires and Cables
- E. UL 1581 - Standard for Electrical Wires, Cables, and Flexible Cords
- F. UL 2196 - Fire Resistive, Fire Resistant and Circuit Integrity Cables

#### 1.4 SUBMITTALS

- A. Submit shop drawings and product data under the provisions of Section 26 05 00.
- B. Submit manufacturer's installation instructions.

### PART 2 - PRODUCTS

#### 2.1 BUILDING WIRE - COPPER

- A. The basis of design is copper conductor.

- B. Feeders and Branch Circuits 10 AWG and Smaller: Copper, solid or stranded conductor, 600-volt insulation, THHN/THWN, unless otherwise noted on the drawings.
- C. Each 120 and 277-volt branch circuit shall have a dedicated neutral conductor. Neutral conductors shall be considered current-carrying conductors for wire derating.

## 2.2 CABLING FOR REMOTE CONTROL, SIGNAL, AND POWER LIMITED CIRCUITS

- A. Wire for the following specialized systems shall be as designated on the drawings, or elsewhere in these specifications. If not designated on the drawings or specifications, the system manufacturer's recommendations shall be followed.
  - 1. Fire alarm
  - 2. Low voltage switching and lighting control
  - 3. Electronic control
- B. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600-volt insulation, rated 60C, individual conductors twisted together, shielded, and covered with a PVC jacket.
- C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300-volt insulation, rated 60C, individual conductors twisted together, shielded, and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

## 2.3 FIRE-RATED AND CIRCUIT INTEGRITY (CI) CABLE AND ASSEMBLIES

- A. Properties and requirements of fire rated cables and assemblies:
  - 1. 2HR fire rated for horizontal and vertical installations.
- B. Acceptable fire-rated cables and listed assemblies:
  - 1. Feeder assembly located outside the structure (example: below finished grade), rated metal stud and drywall enclosure, or encased in concrete; minimum 5 inches of concrete.
  - 2. Exothermal Mat Material: Raceway / Cable protected with exothermic mat material, UL listed.
    - a. Install per manufacturer guidelines and requirements. Apply appropriate quantity of wrapped layers of material as required to achieve rating.
    - b. Contractor shall upsize cable / wiring / raceway sizes as required for derating.
    - c. Provide cable / wire ampacity derating calculations for each application, reference manufacturer for additional information, document and submit derated calculations as a shop drawing submittal for approval prior to installation. Minimum cable / wire derating shall be:
      - 1) Individual conduit raceways (less than or equal to 4" trade size): 10%.

- 2) Parallel conduit raceways associated with the same feeder and protected by a common installation assembly: 15%.
- 3) Cable tray raceway: 50%.

d. Manufacturer:

- 1) 3M Interam Endothermic Mat
- 2) Or submitted for engineer review prior to bid.

### PART 3 - EXECUTION

#### 3.1 WIRE AND CABLE INSTALLATION SCHEDULE

A. Above Accessible Ceilings:

1. Building wire shall be installed in raceway.
2. Metal clad cable, Type MC, 1/2" size with minimum #12 conductors and ground, shall be allowed for flexible whips to individual luminaires on non-essential circuits. The flexible whips shall be between 18" to 72" in length per Electrical Code.

B. All Other Locations: Building wire in raceway.

C. Above Grade: All conductors installed above grade shall be type "THHN".

D. Low Voltage Cable (less than 100 volts): Low voltage cables in ducts, plenums, and other air handling spaces shall be plenum listed. Low voltage cables in non-accessible areas shall be installed in conduit. Low voltage cable may be installed without conduit in accessible areas using the following types of cable supports. Cable support types/systems shall comply with the warranty requirements of the low voltage cable manufacturer.

1. J-hooks
2. Bridle rings with saddle supports

E. Low Voltage Cable (less than 100 volts): Low voltage cable shall be installed in raceway.

F. Fire-Rated 2-Hour Feeders and Circuit Requiring Continuous Operation (CI): Refer to Part 2 of this section for acceptable products and assemblies. Installation shall meet UL 2196.

#### 3.2 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.

B. Use no wire smaller than 18 AWG for low voltage control wiring below 100 volts.

C. Use 10 AWG conductor for 20 ampere, 120-volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277-volt branch circuit home runs longer than 200 feet.

- D. The ampacity of multiple conductors in one conduit shall be derated per the Electrical Code. In no case shall more than 4 conductors be installed in one conduit to such loads as motors larger than 1/4 HP, panelboards, motor control centers, etc.
- E. Splice only in junction or outlet boxes.
- F. Cables or wires shall not be laid out on the ground before pulling.
- G. Care shall be taken so as not to subject the cable or wire to high mechanical stresses that would cause damage to the wire and cable.
- H. At least six (6)-inch loops or ends shall be left at each outlet for installation connection of luminaires or other devices.
- I. All wires in outlet boxes not connected to fixtures or other devices shall be rolled up, spliced if continuity of circuit is required, and insulated.

### 3.3 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Use suitable cable fittings and connectors.
- C. Run all open cable parallel or perpendicular to walls, ceilings, and exposed structural members. Follow the routing as illustrated on the drawings as closely as possible. Cable routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatical, unless noted otherwise. The correct routing, when shown diagrammatically, shall be chosen by the Contractor based on information in the contract documents; in accordance with the manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", recognized industry standards; and coordinated with other contractors.
- D. Open cable shall be supported by the appropriate size J-hooks or other means if called for on the drawings. Wire and cable from different systems shall not be installed in the same J-hook. J-hooks shall be sized with 20% spare capacity. J-hooks shall provide proper bend radius support for data cable and fiber cables.
- E. Open cable installed above suspended ceilings shall not rest on the suspended ceiling construction, nor utilize the ceiling support system for wire and cable support.
- F. J-hook support spans shall be based on the smaller of the manufacturer's load ratings and code requirements. In no case shall horizontal spans exceed 5 feet and vertical spans exceed 4 feet. All J-hooks shall be installed where completely accessible and not blocked by piping, ductwork, inaccessible ceilings, etc. J-hooks shall be independently rigidly attached to a structural element. J-hooks shall be installed to provide 2" horizontal separation and 6" vertical separation between systems.

- G. Open cable shall only be installed where specifically shown on the drawings, or permitted in these specifications.

### 3.4 FIRE-RATED CABLE AND ASSEMBLY INSTRUCTIONS

- A. Terminations of the fire-rated cable must be outside of the fire zone.
- B. Fire-rated cable shall be installed according to the manufacturer's instructions, recommendations, and UL listing.
- C. Route fire-rated cable and assemblies separate from other feeders and distribution. Install cable and assemblies in locations protected from physical damage.
- D. Refer to Electrical Identification Section 26 05 53 for specific identification requirements.

### 3.5 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice and tap only in accessible junction boxes.
- B. Thoroughly clean wires before installing lugs and connectors.
- C. Phase Sequence: All apparatus shall be connected to operate in the phase sequence A-B-C representing the time sequence in which the phase conductors so identified reach positive maximum voltage.
- D. As a general rule, applicable to switches, circuit breakers, starters, panelboards, switchgear and the like, the connections to phase conductors are intended thus:
  - 1. Facing the front and operating side of the equipment, the phase identification shall be:
    - a. Left to Right - A-B-C
    - b. Top to Bottom - A-B-C
- E. Use antioxidant joint compound on all aluminum conductor terminations. Apply antioxidant joint compound per manufacturer's recommendations.

### 3.6 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.
- C. Overspray of paint on any wire or cable will not be accepted. It shall be the Contractor's responsibility to replace any component containing overspray, in its entirety, at no additional cost to the project. Cleaning of the cables with harsh chemicals is not allowed.

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P24010\_002 DTW ADA  
IMPROVEMENTS, ADULT  
CHANGING ROOMS AND BABY  
CHANGING COUNTERS  
Romulus, Michigan

P24010-002

IFB Set  
09-12-2025

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END OF SECTION

## SECTION 26 05 33 - CONDUIT AND BOXES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Rigid metallic conduit and fittings (RMC)
- B. Stainless steel conduit (316SS) and fittings
- C. Intermediate metallic conduit and fittings (IMC)
- D. Electrical metallic tubing and fittings (EMT)
- E. Flexible metallic conduit and fittings (FMC)
- F. Liquidtight flexible metallic conduit and fittings (LFMC)
- G. Rigid polyvinyl chloride conduit and fittings (PVC)
- H. High density polyethylene conduit and fittings (HDPE)
- I. Phenolic reinforced thermosetting resin conduit (Phenolic RTRC)
- J. Wall and ceiling outlet boxes
- K. Electrical connection
- L. Pull and junction boxes
- M. Rough-ins
- N. Handholes
- O. Foundation - Underground Sleeves and Seals
- P. Raceway Seals and Sealant
- Q. Accessories

#### 1.2 RELATED WORK

- A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

### 1.3 REFERENCES

- A. American National Standards Institute (ANSI):
1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated
  2. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated and Fittings
  3. ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
  4. ANSI C80.6 - Intermediate Metal Conduit, Zinc Coated
  5. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
  6. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
- B. Federal Specifications (FS):
1. A-A-50553A - Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall (EMT) Type
  2. A-A-55810 - Specification for Flexible Metal Conduit
- C. NECA "Standards of Installation"
- D. National Electrical Manufacturers Association (NEMA):
1. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
  2. RN 1 - Polyvinyl chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit, Rigid Aluminum Conduit, and Intermediate Metal Conduit
  3. TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit
  4. TC 9 - Fittings for PVC Plastic Utilities Duct for Underground Installation
- E. NFPA 70 - National Electrical Code (NEC)
- F. Underwriters Laboratories (UL): Applicable Listings
1. UL 1 - Flexible Metal Conduit
  2. UL 6 - Rigid Metal Conduit
  3. UL 360 - Liquid Tight Flexible Steel Conduit
  4. UL514-B - Conduit Tubing and Cable Fittings
  5. UL651-A - Type EB and a PVC Conduit and HDPE Conduit
  6. UL651-B - Continuous Length HDPE Conduit
  7. UL746A - Standard for Polymeric Materials - Short Term Property Evaluations
  8. UL797 - Electrical Metal Tubing
  9. UL1242 - Intermediate Metal Conduit
- G. American Standard of Testing and Materials (ASTM):
1. ASTM D 570 - Standard Test Method for Water Absorption of Plastics
  2. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics

3. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edge Wise Position
4. ASTM D 2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
5. ASTM D 2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
6. ASTM D 3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Material

H. Definitions:

1. Fittings: Conduit connection or coupling.
2. Body: Enlarged fittings with opening allowing access to the conductors for pulling purposes only.
3. Mechanical Spaces: Enclosed areas, usually kept separated from the general public, where the primary use is to house service equipment and to route services. These spaces generally have exposed structures, bare concrete and non-architecturally emphasized finishes.
4. Finished Spaces: Enclosed areas where the primary use is to house personnel and the general public. These spaces generally have architecturally emphasized finishes, ceilings and/or floors.
5. Concealed: Not visible by the general public. Often indicates a location either above the ceiling, in the walls, in or beneath the floor slab, in column coverings, or in the ceiling construction.
6. Above Grade: Not directly in contact with the earth. For example, an interior wall located at an elevation below the finished grade shall be considered above grade but a wall retaining earth shall be considered below grade.
7. Slab: Horizontal pour of concrete used for a floor or sub-floor.

PART 2 - PRODUCTS

2.1 RIGID METALLIC CONDUIT (RMC) AND FITTINGS

A. Manufacturers:

1. Atkore Allied Tube & Conduit
2. Nucor
3. Electroline
4. Western Tube
5. Wheatland Tube Co
6. or approved equal.

B. Manufacturers of RMC Conduit Fittings:

1. ABB/Thomas & Betts
2. Eaton/Crouse-Hinds
3. Electroline

- 
4. Emerson Appleton & OZ Gedney
  5. Hubbell Raco and Killark
  6. NSI Bridgeport
  7. Orbit Industries
  8. Wesco Regal
  9. or approved equal.

C. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted.

D. Fittings and Conduit Bodies:

1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.
2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.
3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings shall be watertight and concrete-tight.
4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. High impact phenolic threaded type bushings are not acceptable.
5. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

E. PVC Externally Coated Conduit: Compliant with UL 6, ANSI C80.1 and NEMA RN 1; rigid galvanized steel conduit with external 40 mil PVC coating and internal 2 mil urethane coating surface. All fittings and conduit bodies shall be complete with coating. The PVC coated system shall include necessary PVC coated fittings, boxes and covers to form a complete encapsulated system.

1. Acceptable Manufacturers:
  - a. Atkore Calbond Calpipe
  - b. Robroy Perma-cote and Plati-Bond
  - c. ABB Ocal
  - d. or approved equal.

## 2.2 INTERMEDIATE METALLIC CONDUIT (IMC) AND FITTINGS

A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted.

B. Manufacturers:

1. Atkore Allied Tube & Conduit
2. Nucor
3. Electroline

- 
4. Western Tube
  5. Wheatland Tube Co
  6. or approved equal.

C. Fittings and Conduit Bodies:

1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.
2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.
3. Expansion Joint for Concrete Encased Conduit: Neoprene sleeve with bronze end coupling, stainless steel bands and tinned copper braid bonding jumper. Fittings shall be watertight and concrete-tight.
4. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. High impact phenolic threaded type bushings are not acceptable.
5. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

D. Manufacturers of IMC Conduit Fittings:

1. ABB/Thomas & Betts
2. Easton/Crouse-Hinds
3. Electroline
4. Emerson Appleton & OZ Gedney
5. Hubbell Raco and Killark
6. NSI Bridgeport
7. Orbit Industries
8. Wesco Regal
9. or approved equal.

### 2.3 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Minimum Size Electrical Metallic Tubing: 3/4 inch, unless otherwise noted.

B. Manufacturers of EMT Conduit:

1. Allied Tube & Conduit
2. Calbond Calpipe
3. Nucor
4. Electroline
5. Western Tube
6. Wheatland Tube Co
7. or approved equal.

C. Fittings and Conduit Bodies:

1. 2" Diameter or Smaller: Compression or steel set screw type of steel designed for their specific application.
2. 1/2" and 3/4" Conduit: Push-on connectors and couplers with locking ring and washer of zinc plated steel, listed for use in dry locations.
3. Larger than 2": Compression or steel set screw type of steel designed for their specific application.
4. Manufacturers of EMT Conduit Fittings:
  - a. ABB/Thomas & Betts
  - b. Eaton/Crouse-Hinds
  - c. Electroline
  - d. Emerson Appleton & OZ Gedney
  - e. Hubbell Raco and Killark
  - f. NSI Bridgeport
  - g. Orbit Industries
  - h. Wesco Regal
  - i. or approved equal.

#### 2.4 FLEXIBLE METALLIC CONDUIT (FMC) AND FITTINGS

- A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted. Lighting branch circuit wiring to an individual luminaire may be a manufactured, UL listed 3/8" flexible metal conduit and fittings with #14 AWG THHN conductors and an insulated ground wire. Maximum length of 3/8" FMC shall be six (6) feet.
- B. Manufacturers:
  1. ABB/Thomas & Betts
  2. Anamet Electrical
  3. Atkore American Flex AFC and Flexicon
  4. Electri-Flex Co
  5. Electroline
  6. Southwire Alflex
  7. or approved equal.
- C. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel. Provide a separate equipment grounding conductor when used for equipment where flexibility is required.
- D. Fittings and Conduit Bodies:
  1. Threadless hinged clamp type, galvanized zinc coated cadmium plated malleable cast iron.
  2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.
  3. Manufacturers:

- a. ABB/Thomas & Betts
- b. Eaton/Crouse-Hinds
- c. Electroline
- d. Emerson Appleton & OZ Gedney
- e. Hubbell Raco and Killark
- f. NSI Bridgeport
- g. Orbit Industries
- h. Wesco Regal
- i. or approved equal.

## 2.5 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (LFMC) AND FITTINGS

### A. Manufacturers:

1. ABB/Thomas & Betts
2. Anamet Electrical
3. Atkore American Flex AFC and Flexicon
4. Electri-Flex Co
5. Electroline
6. Southwire Alflex
7. or approved equal.

### B. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel and an extruded PVC cover.

### C. Fittings and Conduit Bodies:

1. Watertight, compression type, galvanized zinc coated cadmium plated malleable cast iron, UL listed.
2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.
3. Manufacturers:
  - a. ABB/Thomas & Betts
  - b. Eaton/Crouse-Hinds
  - c. Electroline
  - d. Emerson Appleton & OZ Gedney
  - e. Hubbell Raco and Killark
  - f. NSI Bridgeport
  - g. Orbit Industries
  - h. Wesco Regal
  - i. or approved equal.

## 2.6 RIGID NON-METALLIC CONDUIT (PVC) AND FITTINGS

### A. Minimum Size Rigid Smooth-Wall Nonmetallic Conduit: 3/4 inch, unless otherwise noted.

B. Acceptable Manufacturers:

1. ABB/Carlton
2. Chevron Phillips Chemical Company
3. Cantex, J.M. Mfg.
4. Atkore Heritage Plastics
5. or approved equal.

C. Construction: Schedule 40 and Schedule 80 rigid polyvinyl chloride (PVC), UL labeled for 90C.

D. Fittings and Conduit Bodies: NEMA TC 3; sleeve type suitable for and manufactured especially for use with the conduit by the conduit manufacturer.

E. Plastic cement for joining conduit and fittings shall be provided as recommended by the manufacturer.

2.7 PHENOLIC REINFORCED THERMOSETTING RESIN CONDUIT AND FITTINGS  
(PHENOLIC RTRC)

A. Minimum Size: 1 inch.

B. Manufacturers:

1. Champion Fiberglass Flameshield XW
2. Atkore - FRE Composites BreathSaver
3. or approved equal.

C. Conduit shall be low smoke, no flame, low toxicity. Conduit shall be fiberglass reinforced phenolic using a filament winding process. Conduit, elbows, conduit bodies, and fittings shall be manufactured from the same resin/hardener/glass system and the same filament wound system. Resin systems shall be phenol with no fillers. Fiberglass used shall be E-type.

D. Fitting and Conduit Bodies:

1. Expansion fittings shall be provided in accordance with Electrical Code.
2. Joints in wet locations and underground locations shall be watertight.

2.8 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, 16 gauge (approximately 0.0625 inches), with 1/2-inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

C. Cast Boxes: NEMA FB1, Type FD, Aluminum, cast ferrous alloy, or stainless steel deep type, gasketed cover, threaded hubs.

- D. Outlet boxes for luminaires to be not less than 1-1/2" deep, deeper if required by the number of wires or construction. The box shall be coordinated with surface luminaires to conceal the box from view or provide a finished trim plate.
- E. Switch outlet boxes for local light control switches, dimmers and occupancy sensors shall be 4 inches square by 2-1/8 inches deep, with raised cover to fit flush with finish wall line. Multiple gang switch outlets shall consist of the required number of gang boxes appropriate to the quantity of switches comprising the gang. Where walls are plastered, provide a plaster raised cover. Where switch outlet boxes occur in exposed concrete block walls, boxes shall be installed in the block cavity with a raised square edge tile cover of sufficient depth to extend out to face of block or masonry boxes.
- F. Outlet boxes for telephone substations in walls and columns shall be 4 inches square and 2-1/8 inches deep with single gang raised cover to fit flush with finished wall line equipped with flush telephone plate.
- G. Wall or column receptacle outlet boxes shall be 4 inches square with raised cover to fit flush with finished wall line. Boxes in concrete block walls shall be installed the same as for switch boxes in block walls.

## 2.9 ECONN; ELECTRICAL CONNECTION

- A. Electrical connection to equipment and motors, sized per Electrical Code. Coordinate requirements with contractor furnishing equipment or motor. Refer to specifications and general installation notes for terminations to motors.

## 2.10 JB; PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.
- B. Sheet metal boxes larger than 12 inches in any dimension that contain terminations or components: Continuous hinged enclosure with 1/4 turn latch and white back panel for mounting terminal blocks and electrical components.
- C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.
- D. Cast Metal Boxes for Underground Installations: NEMA 250; Type 4, inside flanged, recessed cover box for flush mounting, UL listed as raintight. Galvanized cast iron box and plain cover with neoprene gasket and stainless steel cover screws.
- E. Flanged type boxes shall be used where installed flush in wall.

2.11 ROUGH-IN

- A. Provide with one (1) flush mount double gang box with single gang plaster ring and appropriate cover plate,

2.12 RACEWAY SEALS AND SEALANT

- A. Duct Sealant: Field applied expandable duct sealant, closed cell field cured, water tight, air tight. Identified for use with electrical cables, conductors, and raceways. Minimum liquid withstanding of 10-foot head of water (5 PSI). Compatible with conductors and raceways, UL94 Flammability Certified.

- 1. NOT ALLOWED. Duct seal putty, all-purpose construction sealant.

- 2. Manufacturers:

- a. Polywater FST / AFT Series
    - b. Approved equal

- B. Duct Seal Bushing: Custom mechanical seal, liquid tight, gas tight, stainless steel hardware. Minimum liquid withstanding of 10-foot head of water (5 PSI). Coordinate product with raceway size, cable quantities, and cable sizes.

- 1. Manufacturers:

- a. Polywater PHRD / PHSD Series Varia /PHSI Module Series
    - b. Jackmoon Commscope DuctPlug Series
    - c. CalAm Manufacturing WedgeSeal Series

- C. Duct Seal Bushing Alternative Option: Inflatable duct seal system. Capable of withstanding a 10-foot head of water (5 PSI).

- 1. Manufacturers:

- a. Raychem Rayflate Duct Sealing Systems RDSS
    - b. Approved equal

- D. Wall Sleeve Duct Seal System: Cast-in-place or Core-Drill two piece push-in- place construction, gasketed seal to prevent entry of water and gases.

- 1. Cable: Duct Seal Bushing, provide interior sleeve duct seal bushing for each duct entry. Provide duct seal bushings with individual seals for each applicable cable.

- 2. Manufacturers:

- a. Polywater Varia PHSI Series
    - b. Approved equal

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## 2.13 ACCESSORIES

- A. Fire Rated Moldable Pads: UL #9700, moldable sheet putty at required thickness on all five sides of back boxes. Kinetics Noise Control - IsoBacker Pad, SpecSeal - SSP Putty and Pads, 3M #MPP-4S or equal.
- B. Sound Barrier Insulation Pads: Mastic, non-hardening, sheet material, minimum 1/8" thickness applied to all five sides of back boxes. Kinetics Noise Control - SealTight Backer Pad, L.H. DOTTIE Co., #68 or equal.
- C. Electric Threaded Ball Swivel: Metallic body, box mounted, threaded conduit, 20-degree ball swivel, rated for weight of application, listed. Thomas and Betts, Appleton, Couse-hinds, or equal. Example applications:
  - 1. Rigid pendant mount with sloped ceiling, vibration, or subject to wind.

## PART 3 - EXECUTION

### 3.1 INSTALLATION TRAINING

- A. PVC coated rigid metal conduit, phenolic reinforced thermosetting resin conduit (phenolic RTRC), and reinforced thermosetting resin conduit (RTRC) manufacturers shall provide Contractor installation training for field cutting, joint preparation, joint assembly, field bending, and field cut sealing.

### 3.2 CONDUIT INSTALLATION SCHEDULE AND SIZING

- A. In the event the location of conduit installation represents conflicting installation requirements as specified in the following schedule, a clarification shall be obtained from the Architect/Engineer. If this Contractor is unable to obtain a clarification as outlined above, concealed rigid galvanized steel conduit installed per these specifications and the Electrical Code shall be required.
- B. Conduit and boxes requiring re-installation/rework shall match existing materials and meet requirements of these specifications.
- C. Fire Rated Assemblies:
  - 1. Listed Fire Rated Assemblies: Phenolic RTRC
- D. Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to the Electrical Code. Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the Electrical Code (to include enlarged conductors due to temperature and quantity derating values) and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.

E. Minimum Conduit Size (Unless Noted Otherwise):

1. Above Grade: 3/4 inch. (The use of 1/2 inch would be allowed for installation conduit to individual light switches, individual receptacles and individual fixture whips from junction box.)
2. Telecommunication Conduit: 1 inch.
3. Controls Conduit: 3/4 inch.

F. Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically noted on the drawings.

### 3.3 CONDUIT ARRANGEMENT

A. In general, conduit shall be installed concealed in walls, in finished spaces and where possible or practical, or as noted otherwise. Conduit shall be installed parallel or perpendicular to walls, ceilings, and exposed structural members. In unfinished spaces, mechanical and utility areas, conduit may run either concealed or exposed as conditions dictate and as practical unless noted otherwise on drawings. Installation shall maintain headroom in exposed vicinities of pedestrian or vehicular traffic.

B. Exposed conduit on exterior walls or above roof will not be allowed without prior written approval of Architect/Engineer. A drawing of the proposed routing and a photo of the location shall be submitted 14 days prior to start of conduit rough-in. Routing shall be shown on coordination drawings.

C. Conduit arrangement in elevated slabs (restricted to applications specifically noted or shown on drawings):

1. Conduit size shall not exceed one-third of the structural slab thickness. Place conduit between the top and bottom reinforcing with a minimum of 3" concrete cover.
2. Parallel conduits shall be spaced at least 8 inches apart. Exception: Within 18 inches of commonly served floor boxes, junction boxes, or similar floor devices. Arrange conduits parallel or perpendicular to building lines and walls.

D. Conduit shall not share the same cell as structural reinforcement in masonry walls.

E. Conduit runs shall be routed as shown on large scale drawings. Conduit routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatic, unless noted otherwise. The correct routing, when shown diagrammatically shall be chosen by the Contractor based on information in the contract documents, in accordance with manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", in accordance with recognized industry standards, and coordinated with other contractors.

F. Contractor shall adapt Contractor's work to the job conditions and make such changes as required and permitted by the Architect/Engineer, such as moving to clear beams and joists, adjusting at columns, avoiding interference with windows, etc., to permit the proper installation of other mechanical and/or electrical equipment.

- G. Contractor shall cooperate with all contractors on the project. Contractor shall obtain details of other contractor's work to ensure fit and avoid conflict. Any expense due to the failure of This Contractor to do so shall be paid for in full by Contractor. The other trades involved as directed by the Architect/Engineer shall perform the repair of work damaged as a result of neglect or error by This Contractor. The resultant costs shall be borne by This Contractor.

### 3.4 CONDUIT SUPPORT

- A. Conduit runs installed above a suspended ceiling shall be properly supported. In no case shall conduit rest on the suspended ceiling construction, nor utilize ceiling support system for conduit support.
1. Support wire used to independently support raceway and wiring systems above suspending ceilings shall be supported on both ends, minimum 12 gauge suspended ceiling support wire, and distinguishable from ceiling support systems by color (field paint), tagging, or equivalent means.
- B. Conduit shall not be supported from ductwork, water, sprinkler piping, or other non-structural members, unless approved by the Architect/Engineer. All supports shall be from structural slabs, walls, structural members, and bar joists, and coordinated with all other applicable contractors, unless noted otherwise.
- C. Conduit shall be held in place by the correct size of galvanized one-hole conduit clamps, two-hole conduit straps, patented support devices, clamp back conduit hangers, or by other means if called for on the drawings.
- D. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- E. Spring-steel conduit clips specifically designed for supporting single conduits or tubing may be used in lieu of malleable-iron hangers for 1" and smaller raceways serving lighting and receptacle branch circuits above accessible ceilings and for securing raceways to slotted channel and angle supports.
- F. Group conduits in parallel runs where practical and use conduit racks or trapeze hangers constructed of steel channel, suspended with threaded solid rods or wall mounted from metal channels with conduit straps or clamps. Provide space in each rack or trapeze for 25% additional conduits.
- G. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

- I. Supports for metallic conduit shall be no greater than 10 feet. A smaller interval may be used if necessitated by building construction, but in no event shall support spans exceed the Electrical Code requirements. Conduit shall be securely fastened within 3 feet of each outlet box, junction box, device box, cabinet, or fitting.
- J. Supports of flexible conduit shall be within 12 inches of each outlet box, junction box, device box, cabinet, or fitting and at intervals not to exceed 4.5 feet.
- K. Supports for non-metallic conduit shall be at sufficiently close intervals to eliminate any sag in the conduit. The manufacturer's recommendations shall be followed, but in no event shall support spans exceed the Electrical Code requirements.
- L. Where conduit is to be installed in poured concrete floors or walls, provide concrete-tight conduit inserts securely fastened to forms to prevent conduit misplacement.
- M. Finish:
  - 1. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.
  - 2. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1" of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6" of finish floor and presents potential injury to personnel.

### 3.5 CONDUIT INSTALLATION

- A. Conduit Connections:
  - 1. Shorter than standard conduit lengths shall be cut square using industry standards. The ends of all conduits cut shall be reamed or otherwise finished to remove all rough edges.
  - 2. Metallic conduit connections in slab on grade installation shall be sealed and one coat of rust inhibitor primer applied after the connection is made.
  - 3. Where conduits with tapered threads cannot be coupled with standard couplings, then approved split or Erickson couplings shall be used. Running threads will not be permitted.
  - 4. Install expansion/deflection joints where conduit crosses structure expansion/seismic joints.
- B. Conduit terminations for all low voltage wiring shall have nylon bushings installed on each end of every conduit run.
- C. Conduit Bends:
  - 1. Use a hydraulic one-shot conduit bender or factory elbows for bends in conduit 2" in size or larger. All steel conduit bending shall be done cold; no heating of steel conduit shall be permitted.

2. All bends of rigid polyvinyl chloride conduit (PVC) shall be made with the manufacturer's approved bending equipment. The use of spot heating devices will not be permitted (i.e. blow torches).
3. A run of conduit shall not contain more than the equivalent of four (4) quarter bends (360 degrees), including those bends located immediately at the outlet or body.
4. Telecommunications conduits shall have no more than two (2) 90-degree bends between pull points and contain no continuous sections longer than 100 feet. Insert pull points or pull boxes for conduits exceeding 100 feet in length.
  - a. A third bend is acceptable if:
    - 1) The total run is not longer than (33) feet.
    - 2) The conduit size is increased to the next trade size.
5. Telecommunications pull boxes shall not be used in lieu of a bend. Align conduits that enter the pull box from opposite ends with each other. Pull box size shall be twelve (12) times the diameter of the largest conduit. Slip sleeves or gutters can be used in place of a pull box.
6. Telecommunications Conduit(s): Maintain appropriate conduit bend radius at all times. For conduits with an internal diameter of less than 2", maintain a bend radius of at least 6 times the internal diameter. For conduits with an internal diameter 2" or greater, maintain a bend radius of at least 10 times the internal diameter.
7. Rigid polyvinyl chloride conduit (PVC) runs longer than 100 feet or runs which have more than two 90-degree equivalent bends (regardless of length) shall use rigid metal or RTRC factory elbows for bends.
8. Use conduit bodies to make sharp changes in direction (i.e. around beams).

D. Conduit Placement:

1. Conduit shall be mechanically continuous from source of current to all outlets. Conduit shall be electrically continuous from source of current to all outlets, unless a properly sized grounding conductor is routed within the conduit. All metallic conduits shall be bonded per the Electrical Code.
2. Route exposed conduit and conduit above suspended ceilings (accessible or not) parallel/perpendicular to the building structural lines, and as close to building structure as possible. Wherever possible, route horizontal conduit runs above water and steam piping.
3. Route conduit through roof openings provided for piping and ductwork where possible. If not provided or routing through provided openings is not possible, route through roof jack with pitch pocket. Coordinate roof penetrations with other trades.
4. Conduits, raceway, and boxes shall not be installed in concealed locations in metal deck roofing or less than 1.5" below bottom of roof decking.
5. Avoid moisture traps where possible. Where unavoidable, provide a junction box with drain fitting at conduit low point.
6. All conduits through walls shall be grouted or sealed into openings. Where conduit penetrates firewalls and floors, seal with a UL listed sealant.

7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN MASONRY OR EXTERIOR WALLS UNDER THIS DIVISION. A QUALIFIED MASON AT THE EXPENSE OF THIS CONTRACTOR SHALL REPAIR ALL OPENINGS TO MATCH EXISTING CONDITIONS.
8. Seal interior of conduit at exterior entries, air handling units, coolers/freezers, etc., and where the temperature differential can potentially be greater than 20F to prevent moisture penetration. Seal shall be placed where conduit enters warm space. Conduit seal fitting shall be a drain/seal, with sealing compound, identified for use with cable and raceway system.
9. Horizontal conduit routing through slabs above grade
  - a. Conduits, if run in concrete structure, shall be in middle one-third of slab thickness, and leave at least 3" min. concrete cover. Conduits shall run parallel to each other and spaced at least 8" apart centerline to centerline. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement. Maximum conduit outside diameter 1".
  - b. No conduits are allowed in concrete on metal deck unless expressly approved in writing by the Structural Engineer.
  - c. No conduits are allowed to be routed horizontally through slabs above grade.
10. Do not route conduits across each other in slabs on grade.
11. Rigid polyvinyl chloride conduit (PVC) shall be installed when material surface temperatures and ambient temperature are greater than 40F.
12. Contractor shall provide suitable mechanical protection around all conduits stubbed out from floors, walls or ceilings during construction to prevent bending or damaging of stubs due to carelessness with construction equipment.
13. Contractor shall provide a polypropylene pull cord with 2000 lbs. tensile strength in each empty conduit (indoor and outdoor), except in sleeves and nipples.
14. Telecommunications conduits that protrude through the structural floor shall be installed 1 to 3" above finished floor (AFF).
15. Telecommunications conduits that enter into Telecommunications rooms below the finished ceiling shall terminate a minimum of 4" below ceiling and as close to the wall as possible.
16. Telecommunications conduits that are below grade and enter into a building shall terminate a minimum of 4" above finished floor (AFF) and as close to the wall as possible.

### 3.6 CONDUIT TERMINATIONS

- A. Where conduit bonding is indicated or required in the contract documents, the bushings shall be a grounding type sized for the conduit and ground bonding conductor as manufactured by O-Z/Gedney, Appleton, Thomas & Betts, Burndy, Regal, Orbit Industries or approved equal.
- B. Conduits with termination fittings shall be threaded for one (1) lock nut on the outside and one (1) lock nut and bushing on the inside of each box.

- C. Where conduits terminate in boxes with knockouts, they shall be secured to the boxes with lock nuts and provided with approved screw type tinned iron bushings or fittings with plastic inserts.
- D. Where conduits terminate in boxes, fittings, or bodies with threaded openings, they shall be tightly screwed against the shoulder portion of the threaded openings.
- E. Conduit terminations to all motors shall be made with flexible metallic conduit (FMC), unless noted otherwise. Final connections to roof exhaust fans, or other exterior motors and motors in damp or wet locations shall be made with liquidtight flexible metallic conduit (LFMC). Motors in hazardous areas, as defined in the Electrical Code, shall be connected using flexible conduit rated for the environment. Flexible conduit shall not exceed 6' in length. Route equipment ground conductors from circuit ground to motor ground terminal through flexible conduit.
- F. Rigid polyvinyl chloride conduit (PVC) shall be terminated using fittings and bodies produced by the manufacturer of the conduit, unless noted otherwise. Prepare conduit as per manufacturer's recommendations before joining. All joints shall be solvent welded by applying full even coat of plastic cement to the entire areas that will be joined. Turn the conduit at least a quarter to one half turn in the fitting and let the joint cure for 1-hour minimum or as per the manufacturer's recommendations.
- G. All conduit ends shall be sealed with plastic immediately after installation to prevent the entrance of any foreign matter during construction. The seals shall be removed and the conduits blown clear of all foreign matter prior to any wires or pull cords being installed.

### 3.7 RIGID POLYVINYL CHLORIDE CONDUIT (PVC) OVERHEAD CONDUIT INSTALLATION

- A. Conduit shall be installed away from high temperature piping and equipment.
- B. Conduit shall be installed to prevent exposure to ultraviolet radiation.
- C. Proper allowances shall be made for expansion and/or contraction of the conduit during installation.
- D. Expansion fittings shall be installed in any 100' continuous run of conduit and at each 100' thereafter.
- E. Supports shall be made from non-corroding materials and spacing shall not be greater than the listing in the Electrical Code, but also shall not exceed the manufacturer's recommendations depending on the expected surface temperature.

### 3.8 UNDERGROUND CONDUIT INSTALLATION

- A. Conduit Connections:
  - 1. Conduit joints in a multiple conduit run shall be staggered at least one foot apart.

B. Conduit Bends (Lateral):

1. Conduits shall have long sweep radius elbows instead of standard elbows wherever special bends are indicated and noted on the drawings, or as required by the manufacturer of the equipment or system being served.
2. Telecommunications conduit bend radius shall be six times the diameter for conduits under 2" and ten times the diameter for conduits over 2". Where long cable runs are involved, sidewall pressures may require larger radius bends. Coordinate with Architect/Engineer prior to conduit installation to determine bend radius.

C. Conduit Elbows (vertical):

1. Minimum metal or RTRC elbow radiuses shall be 30 inches for primary conduits (greater than 600V) and 18 inches for secondary conduits (less than 600V). Increase radius, as required, based on pulling tension calculation requirements.

D. Expansion Fittings at Finished Grade: Provide underground raceways with an expansion fitting after emerging from finished grade and exterior equipment pads. Field locate the expansion fitting above and within 24 inches of finished grade. Raceways extending less than 12 inches above finished grade, transitioning to LFMC within 12 inches of finished grade, and interior concrete building slabs do not require an expansion fitting unless required by code.

E. Conduit Placement:

1. Conduit runs shall be pitched a minimum of 4" per 100 feet to drain toward the terminations. Duct runs shall be installed deeper than the minimum wherever required to avoid any conflicts with existing or new piping, tunnels, etc.
2. For parallel runs, use suitable separators and chairs installed not greater than 4' on centers. Band conduit together with suitable banding devices. Securely anchor conduit to prevent movement during concrete placement or backfilling.
3. Where concrete is required, the materials for concreting shall be thoroughly mixed to a minimum  $f'c = 2500$  and immediately placed in the trench around the conduits. No concrete that has been allowed to partially set shall be used.
4. Before the Contractor pulls any cables into the conduit, Contractor shall have a mandrel 1/4" smaller than the conduit inside diameter pulled through each conduit and if any concrete or obstructions are found, the Contractor shall remove them and clear the conduit. Spare conduit shall also be cleared of all obstructions.
5. Conduit terminations in manholes, masonry pull boxes, or masonry walls shall be with malleable iron end bell fittings.
6. All spare conduits not terminated in a covered enclosure shall have its terminations plugged as described above.
7. Ductbanks and conduit shall be installed a minimum of 24" below finished grade, unless otherwise noted on the drawings or elsewhere in these specifications.
8. All non-metallic conduit installed underground outside of a slab shall be rigid.

F. Horizontal Directional Drilling:

1. Entire drill path shall be accurately surveyed, with entry and exit stakes placed and coordinated with other contractors. If using a magnetic guidance system, entire drill path shall be surveyed for any surface geo-magnetic variations or anomalies.
2. Any utility locates within 20 feet of the bore path shall have the exact location physically verified by hand digging or vacuum excavation. Restore inspection holes to original condition after verification.

G. Raceway Seal (Exterior to Raceway):

1. All power, telecommunication, electrical conduits and innerducts shall be sealed between the raceway and the building foundation. The raceway penetration shall be sealed liquid-tight, water-tight, non-corrosive.
2. Below Grade Installation Options:
  - a. Cast-in-place concrete installation.
  - b. Hydraulic cement, hydraulic group, hydraulic epoxy.
  - c. Foundation - Underground Sleeves and Seals; refer to Part 2-Products for product information.
3. Above Grade Installation Options:
  - a. Masonry grout for masonry applications.
  - b. Caulk Sealant, interior/exterior rated, color per architect. Approved Manufacturers include Sachco, Tremco Vulkem, Sika or approved equal when not specified by architectural scope.

H. Raceway Seal (Interior to Raceway, with Cables or Empty):

1. All power, telecommunication, electrical conduits and innerducts, including those with cables, shall be sealed at the building and vault entry. The seal shall prevent the entry of liquids or gases. Seal must be compatible with conductors and raceway system. Spare or unused raceways shall also be sealed.
2. Installation Schedule, nominal size:
  - a. 2" or less: Duct Seal Bushing or Duct Sealnt
  - b. 2-1/2" through 4": Duct Seal Bushing
  - c. 5" and 6": Wall Sleeve Duct Seal System

### 3.9 BOX INSTALLATION SCHEDULE

A. Galvanized steel boxes may be used in:

1. Concealed interior locations above ceilings and in hollow studded partitions.
2. Exposed interior locations in mechanical rooms and in rooms without ceilings; higher than 8' above the highest platform level.

3. Direct contact with concrete except slab on grade.
4. Recessed in stud wall of kitchens and laundries.

B. Cast boxes shall be used in:

1. Exterior locations.
2. Hazardous locations.
3. Exposed interior locations within 8' of the highest platform level.
4. Direct contact with earth.
5. Direct contact with concrete in slab on grade.
6. Wet locations.
7. Kitchens and laundries when exposed on wall surface.

### 3.10 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on the Contract Drawings are approximate, unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
- C. Locate and install boxes to allow access. Avoid interferences with ductwork, piping, structure, equipment, etc. Recessed luminaires shall not be used as access to outlet, pull, and junction boxes. Where installation is inaccessible, provide access doors. Coordinate locations and sizes of required access doors with the Architect/Engineer and General Contractor.
- D. Locate and install to maintain headroom and to present a neat appearance.
- E. Coordinate locations with Heating Contractor to avoid baseboard radiation cabinets.

### 3.11 OUTLET BOX INSTALLATION

- A. Do not install boxes back-to-back in walls.
  1. Provide a minimum horizontal separation of 6 inches between boxes installed on opposite sides of non-rated stud walls. When the minimum separation cannot be maintained, install sound insulation pads on all five sides of the back box in accordance with the manufacturer's instructions.
  2. Provide a minimum horizontal separation of 24 inches between boxes installed on opposite sides of fire-rated walls. When the minimum separation cannot be maintained, the box is greater than 16 square inches or the total box area (all trades) per 100 square feet is greater than or equal to 100 square inches, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.

- B. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound Transmission Class (STC) rating.
  - C. The Contractor shall anchor switch and outlet box to wall construction so that it is flush with the finished masonry, paneling, drywall, plaster, etc. The Contractor shall check the boxes as the finish wall surface is being installed to assure that the box is flush. (Provide plaster rings as necessary.)
  - D. Mount at heights shown or noted on the drawings or as generally accepted if not specifically noted.
  - E. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
  - F. Provide knockout closures for unused openings.
  - G. Support boxes independently of conduit.
  - H. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
  - I. Install boxes in walls without damaging wall insulation.
  - J. Coordinate mounting heights and locations of outlets mounted above counters, benches, backsplashes, and below baseboard radiation.
  - K. Position outlets to locate luminaires as shown on reflected ceiling drawings.
  - L. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioned to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
  - M. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
  - N. Provide cast outlet boxes in exterior locations and wet locations, and where exposed rigid or intermediate conduit is used.
- 3.12 PULL AND JUNCTION BOX INSTALLATION
- A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
  - B. Support pull and junction boxes independent of conduit.
  - C. Do not install boxes back-to-back in walls.

1. Provide a minimum horizontal separation of 6 inches between boxes installed on opposite sides of non-rated stud walls. When the minimum separation cannot be maintained, install sound insulation pads on all five sides of the back box in accordance with the manufacturer's instructions.
2. Provide a minimum horizontal separation of 24 inches between boxes installed on opposite sides of fire-rated walls. When the minimum separation cannot be maintained, the box is greater than 16 square inches or the total box area (all trades) per 100 square feet is greater than or equal to 100 square inches, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.

- D. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound Transmission Class (STC) rating.

### 3.13 EXPOSED BOX INSTALLATION

- A. Boxes shall be secured to the building structure with proper size screws, bolts, hanger rods, or structural steel elements.
- B. On brick, block and concrete walls or ceilings, exposed boxes shall be supported with no less than two (2) Ackerman-Johnson, Paine, Phillips, or approved equal screw anchors or expansion shields and round head machine screws. Cast boxes shall not be drilled.
- C. On steel structures, exposed boxes shall be supported to the steel member by drilling and tapping the member and fastening the boxes by means of round head machine screws.
- D. Boxes may be supported on steel members by APPROVED beam clamps if conduit is supported by beam clamps.
- E. Boxes shall be fastened to wood structures by means of a minimum of two (2) wood screws adequately large and long to properly support. (Quantity depends on size of box.)
- F. Wood, plastic, or fiber plugs shall not be used for fastenings.
- G. Explosive devices shall not be used unless specifically allowed.

END OF SECTION

## SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Adhesive Markings and Field Labels
- B. Nameplates and Signs
- C. Product Colors

#### 1.2 RELATED SECTIONS AND WORK

- A. Section 26 05 00 - Basic Electrical Requirements

#### 1.3 REFERENCES

- A. NFPA 70E - Standard for Electrical Safety in the Workplace
- B. NFPA 70 - National Electrical Code (NEC)
- C. ANSI A13.1 - Standard for Pipe Identification
- D. ANSI Z535.4 - Standard for Product Safety Signs and Labels

#### 1.4 QUALITY ASSURANCE

- A. Electrical identification products shall be suitable for the environment installed. Identification labels damaged by the environment due to ultraviolet light fading, damp or wet conditions, physical damage, corrosion, or other conditions shall be replaced with labels suitable for the environment.

### PART 2 - PRODUCTS

#### 2.1 ADHESIVE MARKINGS AND FIELD LABELS

- A. Adhesive Marking Labels for Raceway: Pre-printed, flexible, self-adhesive vinyl labels with legend indicating voltage and service (Emergency, Lighting, Power, HVAC, Communications, Control, Fire).
  - 1. Label Size as follows:
    - a. Raceways: Kroy or Brother labels 1-inch high by 12-inches long (minimum).

2. Color: As specified for various systems.

- B. Colored Adhesive Marking Tape for banding Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.
- C. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Cable Identification: flexible acrylic bands sized to suit the cable diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the cable.
- D. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.
- E. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from -40°F to 185°F (-40°C to 85°C), type 2/2S or type 21/21S based on application. Provide ties in specified colors when used for color coding. Cable ties shall be listed and identified for the application, securement, and support.
- F. Underground Plastic Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inches wide by 4 mil thick, printed legend indicating type of underground line, manufactured for direct burial service. Tape shall contain a continuous metallic wire to allow location with a metal detector.
- G. Aluminum, Wraparound Marker Bands: 1-inch width, 0.014 (5mm) inch thick aluminum bands with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.
- H. Brass or Aluminum Tags: 2" (50mm) by 2" (50mm) by .05-inch metal tags with stamped legend, punched for fastener.
- I. Indoor/Outdoor Number and Letters: Outdoor grade vinyl label with acrylic adhesive designed for permanent application in severe indoor and outdoor environments.
- J. Text Sizes:
  - 1. The following information shall be used for text heights, fonts, and size, unless otherwise noted.
    - a. Font: Normal 721 Swiss Bold
    - b. Adhesive Labels: 3/16 inch minimum text height
    - c. Vinyl / Plastic Laminate Labels: 3/4" inch minimum text height

## 2.2 PRODUCT COLORS

- A. Adhesive Markings and Field Labels:
  - 1. All Labels: Black letters on white face

2. Normal Power and General Labels: Black letters on white face
3. Control Labels: Black letters on white face
4. Medium Voltage (greater than 1,000 volts): Black letters on white face
5. Fire Alarm: Red letters on white face
6. Emergency: Red letters on white face

B. Nameplates and Signs:

1. NORMAL POWER: Black letters on white face
2. Control Labels: Black letters on white face
3. EMERGENCY: White letters on red face
4. GROUNDING: White letters on green face.
5. CAUTION or UPS: Black letters on yellow face

C. Raceways and Conduit:

1. Provide color coded conduit as indicated below. Conduit shall be colored by the manufacturer:
  - a. Normal Power and General Distribution: Silver
  - b. Emergency Power Distribution System:
    - 1) All Emergency: Orange
    - 2) Legally Required Standby: Yellow
    - 3) Optional Standby: Orange
    - 4) Life Safety and Critical Branch: Yellow
    - 5) Equipment Branch: Orange
  - c. Fire Alarm System: Red
  - d. Temperature Controls: Refer to mechanical cover sheet for color
  - e. Ground: Green
  - f. Low Voltage and Telephone: Purple
  - g. Clock, Sound, Security System, and Intercom: Black
  - h. Nurse Call: White

D. Box Covers:

1. Box covers shall be painted to correspond with system type as follows:
  - a. Normal Power and General: Silver
  - b. Emergency Power and Distribution:
    - 1) All Emergency: Orange
    - 2) Legally Required Standby: Yellow
    - 3) Optional Standby: Orange
    - 4) Life Safety and Critical Branch: Yellow
    - 5) Equipment Branch: Orange

- c. Fire Alarm System: Red
  - d. Temperature Controls: Refer to mechanical cover sheet for color
  - e. Ground: Green
  - f. Low Voltage and Telephone: Purple
  - g. Clock, Sound, Security System, and Intercom: Black
  - h. Nurse Call: White
2. Box cover colors shall match conduit colors listed above.
- E. Conductor Color Identification: Refer to Part 3 for additional information.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as required by code.
- B. Exposed Ceilings and Finished Spaces: The project includes exposed ceilings in finished spaces. The installation of colored raceways and labeling may not be aesthetically desirable in finished spaces. The contractor shall coordinate identification requirements in exposed ceilings of finished spaces with the Architect/Engineer prior to installation and ordering of materials.
- C. Electrical System Color Chart: This Contractor shall furnish and install framed 8" x 12" charts of the color-coded identification scheme used for the electrical system in all electrical rooms and next to the main fire alarm panel.
- D. Install identification devices in accordance with manufacturer's written instruction and requirements of Electrical Code.
- E. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work. All mounting surfaces shall be cleaned and degreased prior to identification installation.
- F. Circuit Identification: Tag or label conductors as follows:
  - 1. Multiple Power or Lighting Circuits in Same Enclosure: Where multiple branch circuits are terminated or spliced in a box or enclosure, label each conductor with source and circuit number.
  - 2. Multiple Control Wiring and Communication/Signal Circuits in Same Enclosure: For control and communications/signal wiring, use wire/cable marking tape at terminations in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tape.

3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

G. Apply Danger, Warning, Caution and instruction signs as follows:

1. Install Danger, Warning, Caution or instruction signs where required by Electrical Code, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. 'Danger' indicates a hazardous situation which, if not avoided, will result in death or serious injury. ANSI standard red background, white letters.
3. 'Warning' indicates a hazardous situation which, if not avoided, could result in death or serious injury. ANSI standard orange background, black letters.
4. 'Caution' indicates a hazardous situation which, if not avoided, may result in minor or moderate injury. ANSI standard yellow background, black letters.
5. Emergency Operating Signs: Install, where required by Electrical Code, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect, engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

H. Apply circuit/control/item designation labels of engraved plastic laminate for pushbuttons, pilot lights, alarm/signal components, and similar items, except where labeling is specified elsewhere.

I. Install labels parallel to equipment lines at locations as required and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

J. Selective Coordination Label: Install caution signs on all switchboards, distribution panels, panelboards, disconnects, and other equipment with selectively coordinated overcurrent protection devices. Sign at a minimum shall contain:

1. CAUTION: OVERCURRENT DEVICES IN THIS ENCLOSURE ARE SELECTIVELY COORDINATED. EQUIVALENT REPLACEMENTS AND TRIP SETTINGS ARE REQUIRED.

### 3.2 FEEDER AND BRANCH CIRCUIT DIRECTORIES

A. Product:

1. Adhesive labels and field markings
2. Nameplates and signs

- B. Feeder Directories Branch: Provide each feeder, branch circuit, feeder modification, and branch circuit modification with a typed circuit directory label. Refer to technical equipment specification sections for additional requirements. Include the following with each label:
  - 1. Load Description: Lighting, receptacles, specific equipment, spare, space, or similar description.
  - 2. Location: Room name, number, location.
- C. Provide a factory or custom clear plastic sleeve for each branch panel directory and secure to inside panel cover.

### 3.3 |LIGHTING CONTROL AND RECEPTACLE COVER PLATES

- A. Product:
  - 1. Adhesive labels and field markings
  - 2. Nameplates and signs
- B. Identification material to be a clear, 3/8-inch Kroy tape or Brother self-laminating vinyl label with black letters. Embossed Dymo-Tape labels are not acceptable. Permanently affix identification label to cover plates, centered above the receptacle openings.
- C. Identification material to be engraved plastic-laminated labels, 1/16-inch minimum thickness with white letters on a red face. Letter and number size to 1/8-inch high.
- D. Identification to be engraved directly on the stainless steel coverplates. Letter and number size to 1/8-inch high.
- E. Provide identification on all switch and receptacle cover plates. Identification shall indicate source and circuit number serving the device (e.g. "C1A #24").

### 3.4 CONDUIT AND EXPOSED CABLE LABELING

- A. Product:
  - 1. Adhesive labels and field markings
- B. Conduit Identification: Pre-printed, flexible, self-adhesive vinyl labels with legend at 25 foot (7.5 meter) intervals to identify all conduits run exposed or located above accessible ceilings. Conduits located above non-accessible ceiling or in floors and walls shall be labeled within 3 feet of becoming accessible, or separated by enclosures, walls, partitions, ceilings, and floors. Labels for multiple conduits shall be aligned. Refer to color requirements in Part 2 when applicable in addition to the following:
  - 1. Essential Electrical System EES: When applicable the label shall include "Essential Electrical System EES". Maximum interval between label intervals shall be 25 feet or as required by code.

2. Fire Alarm: Indicate "FIRE ALARM".
3. Grounding: Indicate "GROUND" and equipment and designation.
4. Security System: Indicate "Security".
5. Telephone System: Indicate "Telephone".

- C. Blank conduit ends or outlet boxes for future extension of system shall have permanent identification marker indicating purpose of conduit or box and where the raceway originated.

### 3.5 CONDUIT AND RACEWAY COLOR BANDING FOR EXISTING CONDITIONS AND REMODELING

- A. Existing Conduit and Raceways: Identify existing conduits and raceways within the limits of the project boundary with color banding.

1. Existing conduit and raceways to be color banded: 3/4 inch and larger.
2. The Contractor shall perform a review of the existing conduit, raceway, and system type prior to submitting a bid. The Contractor's review shall include a review of areas with non-finished ceilings and areas with accessible finished ceilings.

- B. New Conduit and Raceways: Identify new conduits and raceways with color banding. The following products and materials shall be identified with color banding when required by Part 1 of this specification.

1. Rigid metallic conduit and fittings (RMC)
2. Intermediate metallic conduit and fittings (IMC)
3. Reinforced thermosetting resin conduit (RTRC)
4. Phenolic reinforced thermosetting resin conduit (phenolic RTRC conduit) Example:  
Fire-rated cable and assemblies
5. Wire and cable installed with or without raceways:
  - a. Fire-rated cable and assemblies (including but not limited to MI, fire-rated MC)
  - b. Low voltage cabling

- C. Instructions:

1. Band exposed or accessible raceways, cables, and bare conductors. Bands shall be pretensioned, snap-around colored plastic sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side. Refer to Part 1 of this specification for specific systems and colors requiring banding.
2. Install bands at changes within 36 inches of direction changes, all wall/floor penetrations, at each junction box, and at 10-foot maximum intervals in straight runs.

### 3.6 BOX LABELING

- A. Products:

1. Adhesive labels and field markings

- 
- B. Identify Junction, Pull and Connection Boxes: Labeling shall be 3/8-inch Kroy tape OR Brother self-laminating vinyl label, letters/numbers color coded same as conduits.
  - C. All junction, pull, and connection boxes shall be identified as follows:
    - 1. For power and lighting circuits, indicate system voltage and identity of contained circuits ("120V, 1LA1-3,5,7").
    - 2. Essential Electrical System EES: When applicable the label shall include "Essential Electrical System EES". Maximum interval between label intervals shall be 25 feet or as required by code.
    - 3. For other wiring, indicate system type and description of wiring ("FIRE ALARM NAC #1").

### 3.7 CONDUCTOR COLOR CODING

- A. Products:
  - 1. All wire and cables shall be color coded by the manufacturer.
- B. Color coding shall be applied at all panels, switches, junction boxes, pull boxes, vaults, manholes etc., where the wires and cables are visible and terminations are made. The same color coding shall be used throughout the entire electrical system, therefore maintaining proper phasing throughout the entire project.
- C. Colored cable ties shall be applied in groups of three ties of specified color to each conductor at each terminal or splice point starting 3 inches from the termination and spaced at 3- inches centers. Tighten to a snug fit, and cut off excess length.
- D. Where more than one nominal voltage system exists in a building or facility, each ungrounded conductor of a multi-wire branch circuit, where accessible, shall be identified by phase and system.
- E. Conductors shall be color coded as follows:
  - 1. 120/240 Volt, 3-Wire:
    - a. A-Phase - Black
    - b. B-Phase - Red
    - c. Neutral - White
    - d. Ground Bond - Green
  - 2. 208Y/120 Volt, 4-Wire:
    - a. A-Phase - Black
    - b. B-Phase - Red
    - c. C-Phase - Blue
    - d. Neutral - White

- 
- e. Ground Bond - Green
3. 480Y/277 Volt, 4-Wire:
    - a. A-Phase - Brown
    - b. B-Phase - Orange
    - c. C-Phase - Yellow
    - d. Neutral - Gray
    - e. Ground Bond - Green
  4. 120 Volt, 2-Wire Isolated (Ungrounded) Power System:
    - a. A-Phase - Orange with distinctive colored stripe other than white, green or gray along the entire length of the conductor
    - b. B-Phase - Brown with distinctive colored stripe other than white, green or gray along the entire length of the conductor
    - c. Ground Reference - Green
  5. 120/208 Volt, 3-Wire, Isolated (Ungrounded) Power System:
    - a. A-Phase - Orange with distinctive colored stripe other than white, green or gray along the entire length of the conductor
    - b. B-Phase - Brown with distinctive colored stripe other than white, green or gray along the entire length of the conductor
    - c. C-Phase - Yellow with distinctive colored stripe other than white, green or gray along the entire length of the conductor
    - d. Ground Reference - Green
  6. 0 to 1500 Volt, Direct Current DC Power System:
    - a. Ungrounded Positive Polarity: Red or black with permanent red stripe marked along the entire length. Provide shrink wrap sleeves at terminations indication (POS, POSITIVE, or POS (+)).
    - b. Ungrounded Negative Polarity: Black. Provide shrink wrap sleeves at terminations indication (NEG, NEGATIVE, or NEG (-)).
    - c. Grounded Conductor in Grounded DC systems (refer to paragraphs a and b above for marking of ungrounded conductors):
      - 1) When Positive Polarity is Grounded: White along entire length. Provide shrink wrap sleeves at terminations indication (POS, POSITIVE, or POS (+)).
      - 2) When Negative Polarity is Grounded: White along entire length. Provide shrink wrap sleeves at termination indication (NEG, NEGATIVE, or NEG (-)).
  7. Grounding Conductors:

- 
- a. Equipment grounding conductors, main/system/supply-side bonding jumpers: Green.
  - b. Isolated Equipment Ground Conductors: Green with colored distinctive yellow stripe along the entire length of the conductor. Isolated ground for feeders, use colored tape with alternating bands of green and yellow to provide a minimum of three bands of green and two bands of yellow.
8. Cabling for Remote Control, Signal, and Power Limited Circuits:
- a. Fire Alarm: Red.
  - b. Low Voltage Switching: Per manufacturer recommendations and code requirements.
  - c. Building Automation Systems and Control: Refer to the Temperature Control Contactor notes located on the mechanical cover sheet.
  - d. Nurse Call: Refer to Division 27.
  - e. Electronic Control: Per manufacturer recommendations and code requirements.
  - f. Audio/Visual Systems: Refer to Division 27.
  - g. Structured Cabling: Refer to Division 27.
- 3.8 EQUIPMENT CONNECTION IDENTIFICATION
- A. Identification shall be provided for all connections to equipment furnished by this Contractor, other contractors, or the Owner.
- 3.9 POWER DISTRIBUTION EQUIPMENT IDENTIFICATION
- A. Products:
1. Nameplates and signs
- B. Provide identification on the front of all power distribution equipment such as panelboards, switchboards, switchgear, motor control centers, generators, UPS, storage battery disconnects, transfer switches, etc. Labels shall be visible on the exterior of the gear, correspond to the one-line diagram nomenclature, and identify each cubicle of multi-section gear.
1. Interior Equipment: The identification material shall be engraved plastic-laminated labels.
  2. Exterior Equipment: The identification material shall be engraved vinyl labels.
  3. Labeling shall include:
    - a. Essential Electrical System EES: When applicable the label shall include "Essential Electrical System EES". Applicable equipment includes components of the life safety and critical branch for healthcare facilities (generators, transfer switches, switchboards, distribution panels, panelboards, etc.).
    - b. Equipment type and contract documents designation of equipment.
    - c. Voltage of the equipment.

- d. Name of the upstream equipment and location of the upstream equipment if it is not located within sight.
- e. Rating and type of the overcurrent protection device serving the equipment if it is not located within sight ("FED BY 400A/3P BREAKER").
- f. Sample Label:

DISTRIBUTION PANEL DP-H1  
480Y/277V  
FED FROM SWITCHBOARD "SB-1" (LOCATED IN MAIN ELEC ROOM)

4. Provide the following on a separate label, installed below the label above:

- a. Available fault current; refer to one-line diagram or panel schedules
- b. Date of fault current study; refer to one-line diagram
- c. Sample Label:

22,000 AMPS AVAILABLE FAULT CURRENT  
DATE OF STUDY: 1 JAN 2017

- C. Service Equipment Label: A separate nameplate for the service entrance equipment and include:

1. Nominal system voltage, service wire size, quantity, material, distance
2. Maximum available fault current; refer to one-line diagram for values
3. Clearing time of overcurrent protection devices based on available fault current. Refer to calculations and report from Section 26 05 73 for value.
4. Date of fault current study; refer to one-line diagram
5. Date of label
6. Sample Label:

480Y/277V, 6 SETS 4#750KCM CU, 75FT  
39,800 AMPS AVAILABLE FAULT CURRENT  
0.07 SECOND CLEARING TIME  
DATE OF STUDY: 1 JAN 2017  
DATE OF LABEL: 4 JUL 2017

- D. Arc Energy Reduction Label:

1. Provide a separate engraved plastic laminate label centered at the top of each vertical section of the electrical gear indicating the following when applicable.
  - a. Applicable Systems:
    - 1) Zone-selective interlocking system for selective coordination and arc energy reduction
    - 2) Differential relaying system for selective coordination and arc energy reduction
    - 3) Arc energy reducing maintenance switch

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4) Energy reducing active arc flash mitigation system

E. Adjustable-Trip Over Current Protection Label:

1. Provide a separate engraved plastic laminate label adjacent to each overcurrent projection device with adjustable trip settings. Provide label separate from load identification label.

- a. Label:

- 1) Long-time delay:
- 2) Long-time pickup:
- 3) Short-time delay:
- 4) Short-time pickup:
- 5) Instantaneous:
- 6) Ground fault delay:
- 7) Ground fault:

- b. Sample Label:

Long-time delay: 10.0  
Long-time pickup: 1.0  
Short-time delay: 0.15  
Short-time pickup: 5.0  
Instantaneous: 2.0  
Ground fault delay: 0.25  
Ground fault: 50.0

F. Nominal System Voltage Label:

1. Where more than one nominal voltage system exists in a building or facility, the identification of color coding used in the panelboard or equipment shall be permanently posted on the interior of the door or cover.

G. Distribution panelboards and switchboards shall have each overcurrent protection device identified with name and location of the load being served ("AHU-1 LOCATED IN PENTHOUSE 1"). Provide a separate engraved plastic laminate label adjacent to each overcurrent projection device with feeder wire size, feeder wire quantity, conductor material and distance in feet. Provide label separate from load identification label and adjustable trip settings label.

1. Sample Labels for Feeders:

4#3/0 CU & 1#6 CU GND, 125FT  
4#250KCM AL & 1#6 GND CU, 125FT  
2 SETS 4#400KCM CU & 1#1 GND CU, 125FT

- H. Branch panelboards shall be provided with typed panel schedules upon completion of the project. Existing panelboards shall have their existing panel schedules typed, with all circuit changes, additions or deletions also typed on the panel schedules. A copy of all panel schedules for the project shall be turned over as part of the O&M Manuals. Refer to Section 26 05 00 for other requirements.

### 3.10 INDUSTRIAL CONTROL PANEL IDENTIFICATION

A. Products:

1. Nameplates and signs

- B. Provide identification on the front of all industrial control panels and similar equipment. Labels shall be visible on the exterior of the gear and correspond to the one-line and/or schematic diagram nomenclature.

1. Interior equipment: The identification material shall be engraved plastic-laminated labels.
2. Labeling shall include:

- a. Equipment type and contract documents designation of equipment.
- b. Manufacturer / Assembler of industrial control panel
- c. Voltage, phase, frequency, full load current of each supply circuit
- d. Name of the upstream equipment and location of the upstream equipment if it is not located within sight.
- e. Rating and type of the overcurrent protection device serving the equipment if it is not located within sight ("FED BY 400A/3P BREAKER").
- f. Sample Label:

INDUSTRIAL CONTROL PANEL ICP-1  
ABC COMPANY  
480V, 3PHASE, 60HZ, 60A (PANEL E1-1 LOCATED IN ELEC 123)  
120V, 1PHASE, 60HZ, 20A (PANEL E2-1 LOCATED IN ELEC 123)  
22,000 SHORT CIRCUIT RATING

C. Nominal System Voltage Label:

1. Where more than one nominal voltage system exists in a building or facility, the identification of color coding used shall be permanently posted on the interior of the door or cover of the industrial control panel.

- D. Schematic Diagram: Provide a laminated copy of the industrial control panel schematic wiring diagram. Post the diagram on the inside cover of the control panel.

- E. Service Equipment Label: Refer to Electrical Distribution Equipment - Service Equipment Label of this specification if applicable for additional requirements.

### 3.11 TRANSFORMER EQUIPMENT IDENTIFICATION

#### A. Products:

1. Nameplates and signs

#### B. Provide identification on the front of all transformers. The identification nameplate shall be an engraved plastic-laminated label.

#### C. Labeling shall include:

1. Equipment type and contract documents designation of equipment
2. Name of the upstream equipment.
3. Voltage and rating of the equipment.
4. Location of the upstream equipment if it is not located within sight.
5. Sample Label:

TRANSFORMER TR-15  
480V: 208Y/120V 15KVA  
FED FROM SWITCHBOARD "SB-1" (LOCATED IN ELEC 123)

### 3.12 DC VOLTAGE EQUIPMENT IDENTIFICATION

#### A. Products:

1. Names and signs

#### B. Provide identification on the front of all DC voltage equipment, storage batteries, disconnects. The identification nameplate shall be engraved plastic-laminate label.

#### C. Label shall include:

1. Equipment type and contract documents designation of equipment.
2. Name of upstream equipment and location of the upstream equipment if it is not located within sight.
3. Nominal equipment voltage and rating.
4. Available fault current (from batteries if applicable).
5. Date of fault current study; refer to one-line diagram.
6. Sample Label:

STORAGE BATTERY SB-1  
600 VOLT DC, 50 KVA  
39,800 AMPS AVAILABLE FAULT CURRENT  
DATE OF STUDY: 1 JAN 2017

### 3.13 ELECTRICAL WORKING CLEARANCE IDENTIFICATION

- A. Products:
  - 1. Safety Yellow paint and custom stencils
- B. Provide custom identification of electrical equipment working clearances in mechanical, electrical, storage, janitorial, and similar non-public areas.
- C. Identification shall include a painted rectangular box (on the finished floor) in front of the electrical equipment to define the code-required working clearance. Provide additional diagonal stripping inside the rectangle box. All painted stripping shall be safety yellow paint with 3 inch wide stripes.
  - 1. Width of area: Width of equipment or as required by code
  - 2. Depth of area: Depth as required by code

### 3.14 SERIES RATING IDENTIFICATION

- A. Products:
  - 1. Nameplates and signs
- B. Upstream devices of series rated components not enclosed in a single NEMA type enclosure shall be identified with a nameplate reading "CAUTION - SERIES RATED SYSTEM - IDENTICAL COMPONENT REPLACEMENT REQUIRED".
- C. Downstream devices of series rated components not enclosed in a single NEMA type enclosure shall be identified with a nameplate reading "CAUTION - SERIES RATED SYSTEM - ADDITIONAL SERIES COMBINATION RATING: XX,XXX RMS SYMMETRICAL AMPERES" where XX,XXX shall be the series combination rating.

### 3.15 DWELLING UNIT IDENTIFICATION

- A. Products:
  - 1. Nameplates and signs
- B. Emergency Disconnect (exterior), provide EMERGENCY DISCONNECT label on exterior emergency disconnect, red background, white letters, 1/2" high letters, or as required by code. The identification nameplate shall be engraved plastic-laminate label.

### 3.16 POLE IDENTIFICATION

- A. Product:
  - 1. Adhesive labels and field markings

2. Nameplates and signs

- B. Lighting poles, bollards and overhead distribution poles shall be individually identified with a unique number, for maintenance purposes. Apply the vinyl label number above the hand hole cover or 24" (610mm) above grade. Bollards may be identified with a number applied inside the luminaire that is visible from the exterior.

END OF SECTION

## SECTION 26 09 33 - LIGHTING CONTROL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED SECTIONS

- A. The lighting system design includes a combination of luminaire sources, lighting control components, programming sequences, and supplementary components for building and energy code compliance. The design uses performance-based specifications for portions of the lighting system to account for the limitation of directly comparable product solutions available by competitive manufacturers. The Contractor shall reference related specification sections, plans, schedules, and details prior to submitting pricing, submittals, and installation. The Contractor shall coordinate system component compatibility among various manufacturers and suppliers for a turnkey lighting system. Referenced sections include, but are not limited to, the following:
1. Specification Section 26 51 19 LED Lighting
  2. Electrical Drawings: Electrical Coversheet, plans, luminaire schedules, lighting control sequence of operations, diagrams, and details.

#### 1.2 QUALITY ASSURANCE

- A. Manufacturers shall be regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. All components and assemblies are to be factory pre-tested prior to delivery and installation.

#### 1.3 REFERENCES

- A. FCC Rules and Regulations, Part 15, Subpart J - Radio Frequency Interference
- B. FS W S 896 Switch, Toggle
- C. International Energy Conservation Code (IECC)
- D. NEMA WD 1 - General Color Requirements for Wiring Devices
- E. NEMA WD 7 - Occupancy Motion Sensors
- F. NFPA 70 - National Electrical Code (NEC)
- G. UL Standard 916 Energy Management Equipment
- H. UL 924 - Emergency Lighting and Power Equipment
- I. UL 20 - Standards for General-Use Snap Switches

- J. UL 98 - Enclosed and Dead-Front Switches
  - K. UL 1008 - Transfer Switch Equipment
  - L. UL 1472 - Solid-State Dimming Controls
- 1.4 PROJECT RECORD DOCUMENTS
- A. Submit project record documents under provisions of Section 26 05 00.
  - B. Accurately record location of all controls and devices. Include description of switching sequences and circuiting arrangements.
- 1.5 OPERATION AND MAINTENANCE DATA
- A. Submit emergency, operation, and maintenance data under provisions of Section 26 05 00. Data shall also include the following:
    - 1. Schedule for routine maintenance, inspection, and calibration of all lighting control devices and system components. Recommended schedule for inspection and recalibration of sensors.
    - 2. Complete narrative describing intended operation and sequence for each control scenario and system component, updated to reflect all changes resulting from commissioning of systems. Narrative shall indicate recommended settings for devices where applicable.
    - 3. Replacement part numbers for all system components.
  - B. Identify installed location and labeling for each luminaire controlled by automated lighting controls.
  - C. Submit software operating and maintenance manuals, program software backup on compact disc or compatible media with data files, device address list, and a printout of software application and graphic screens, where applicable.
- 1.6 SYSTEM DESCRIPTION
- A. Performance Statement: The specification section and lighting design documents describe the minimum material quality, required features, and operational performance requirements of the lighting control system. The documents do not convey every component, relay, wire, and equipment connection required. The Contractor and lighting control manufacturer/vendor are solely responsible for determining all system components, wiring, and programming required for a complete and operational system based on the performance based requirements of the documents.
  - B. Lighting Sequence Of Operation (SOO): The Sequence Of Operation (SOO) describes the required lighting control operation and performance in each space. The Sequence Of Operation descriptions are included on the drawings.

- C. Drawings: The drawings include the Sequence Of Operation (SOO), luminaire schedule, location of control devices, sensors, and identification of control zones, and branch power circuiting. Control wiring and manufacturer/vendor specific components are NOT shown, but shall be submitted with the shop drawing submittals.

## 1.7 COMMISSIONING

- A. The Contractor shall notify the Architect/Engineer and Owner's Representative ten (10) working days prior to scheduled commissioning date.
- B. The system shall be functionally tested by a factory-authorized engineer and comply with the Sequence of Operation prior to system commissioning. All loads shall be tested live for continuity and freedom from defects, and all control wiring shall be tested for continuity and connections prior to energizing the system.

## 1.8 WARRANTY

- A. Manufacturer shall warrant products under normal use and service to be free from defects in materials and workmanship for a period of two (2) years from date of commissioning.
- B. Automatic (occupancy, vacancy), daylight sensors, and controls shall have a five (5) year warranty from date of Substantial Completion.

## PART 2 - EXECUTION

### 2.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify field dimensions and coordinate physical size of all equipment with the architectural requirements of the spaces into which they are to be installed. Allow space for adequate ventilation and circulation of air.
- C. Verify that required utilities are available, in proper location, and ready for use.
- D. Beginning of installation means installer accepts existing conditions.

### 2.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings.
- B. Low Voltage Cabling (less than 100 volts): Low voltage lighting control cabling shall be plenum listed. Low voltage cables in non-accessible areas shall be installed in conduit. Low voltage lighting control cable may be installed without conduit in accessible areas using the following types of cable supports. Cable support types/systems shall comply with the warranty requirements of the low voltage cable manufacturer.

1. J-hooks; batwing type.
2. Bridle rings with saddle supports.
3. Low voltage cable batwings supported by independent luminaire support systems (luminaire support cabling); use of batwings on ceiling support systems not allowed.
4. Listed cable ties. Low voltage cabling secured to exterior of luminaire power raceway.

C. All branch load circuits shall be live tested before connecting the loads to the lighting control panel.

D. Lighting Control Station Wiring: Provide the grounded (neutral) conductor portion of the branch circuit with the line voltage phase conductors at each lighting control station.

## 2.3 BRANCH CIRCUIT POWER WIRING FOR CONTROLLERS

1. Branch circuit power for the following lighting control system components shall be provided from the following branches. Lighting control power shall originate from the same branch circuits serving the controlled luminaires:

## 2.4 LOW VOLTAGE LIGHTING CONTROL CABLING

A. Control Cable Raceway Routing: Class II low voltage control wiring may be open wiring, independently supported, and shall maintain 150 mm (6 inch) spacing from luminaire drivers and other RFI/EMI sources.

B. Control Cabling Installed with Line Voltage Wiring: When low voltage control cabling is installed with line-voltage wiring, the control wiring shall be, copper conductors, minimum 16 AWG or per manufacturer, with cable insulation equal to the line-voltage rating (voltage, temp rating, etc.) and comply with Specification Section 26 05 13 "Wire and Cable."

C. Network Cabling: As required by manufacturer.

D. Splices and Taps: Tapping or wire trap connectors shall be used to splice all Class 1 and Class 2 control wiring. Twist-on, wire-nut type connectors are not allowed.

## 2.5 SUPPORT SERVICES

A. System Startup:

1. Manufacturer shall provide factory authorized technician to confirm proper installation and operation of all system components.

B. Pre-Program, Testing, Training Coordination:

1. The construction documents and sequence of operations define the original design intent of the lighting controls as coordinated between the owner and the design team. The definition of the scope is intended to identify the hardware and programming flexibility required prior to programming, system testing, and owner training.

2. The final system programming, control station labels, scene presets, dimmer presets, dimmer range limits, fade times, etc. are subject to on site coordination between the design team, owner, contractor, and manufacturer. Contractor/manufacturer programming of the system prior to an onsite coordination with the owner and design team shall not be considered final programming nor commissioning.
3. The contractor and manufacturer shall provide on site representatives to provide final programming including preset, scene, switch labeling, and other programming adjustments based on owner and design team onsite observation and verbally requested adjustments as part of the based bid scope of work.
4. The contractor shall document onsite requested changes and update operation and maintenance manuals to match final programming.

C. Testing:

1. System shall be completely functional tested by a factory-authorized technician. All loads shall be tested live for continuity and freedom from defects, and all control wiring shall be tested for continuity and connections prior to energizing the system components.
2. Programming of initial zones, schedules, lighting levels, control station groups, and sensor settings shall be performed by a factory-authorized technician. Lighting Control Sequence of Operation shall serve as a basis for programming, However, all final decisions regarding groups and schedules shall be at the direction of the Owner. The following procedures shall be performed at a minimum:
  - a. Confirm automatic sensor placement, sensitivity, and time delay settings to meet specified performance criteria.
  - b. Confirm daylight sensor placement, sensitivity, deadband, and delay settings to meet specified performance criteria.
  - c. Confirm that schedules and time controls are configured to meet specified performance criteria and Owner's operating requirements.
  - d. Confirm control station labeling, presets, switch labels, and scenes.
3. Verify occupancy/vacancy and daylight sensor operation is correct after furniture and equipment is installed in each area. Make adjustments to sensor settings and time delays to allow proper operation.
4. Verify occupancy/vacancy sensors are located to provide complete coverage for the area served with no nuisance switching.
  - a. Relocate sensors or provide additional sensors as necessary to provide adequate coverage.
  - b. Mask occupancy/vacancy sensors where necessary to prevent nuisance switching from adjacent areas.

D. Documentation:

1. Manufacturer shall provide system documentation including:

- a. System one-line showing all panels, number and type of control stations and sensors, communication line, and network or building automation system BAS interface unit.
- b. Drawings for each panel showing hardware configuration and numbering.
- c. Panel wiring schedules.
- d. Typical diagrams for each component.

END OF SECTION

## SECTION 26 51 19 - LED LIGHTING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Interior luminaires and accessories
- B. Light-emitting diode (LED) luminaire systems
- C. LED emergency lighting units
- D. Emergency exit signs

#### 1.2 RELATED SECTIONS

- A. The lighting system design includes a combination of luminaire sources, lighting control components, programming sequences, and supplementary components for building and energy code compliance. The design uses performance-based specifications for portions of the lighting system to account for the limitation of comparable product solutions available by competitive manufacturers. The Contractor shall reference related specification sections, plans, schedules, and details prior to submitting pricing, submittals, and installation. The Contractor shall coordinate system component compatibility among various manufacturers and suppliers for a turnkey lighting system. Referenced sections include, but are not limited to, the following:
  - 1. 26 09 33 Lighting Control Systems
  - 2. Electrical drawings: Plans, luminaire schedules, lighting control sequence of operations, diagrams, and details.

#### 1.3 REFERENCES

- A. ANSI C78.377 - Specifications for the Chromaticity of Solid State Lighting Products
- B. ANSI C82.16 - Light-Emitting Diode Drivers - Method of Measurement
- C. ANSI C82.77 - Standard for Harmonic Emission Limits and Related Power Quality Requirements for Lighting Equipment
- D. NFPA 70E - National Electrical Safety Code
- E. NEMA SSL1 - Electronic Drivers for LED Devices, Arrays or System
- F. UL 8750 - Light Emitting Diode (LED) Equipment for use in Lighting Products
- G. LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

- H. LM-80 - Measuring Luminous Flux and Color Maintenance of LED
- I. FS W-L-305 - Light Set, General Illumination (Emergency or Auxiliary)
- J. UL 924 - Standard for Emergency Lighting and Power Equipment
- K. UL676 Standard for Underwater Luminaires and Submersible Junction Box

#### 1.4 SUBMITTALS

- A. Submit product data under provisions of Section 26 05 00.
- B. Basic Requirements of Submittal:
  - 1. Submit product data sheets for luminaires, LED light engines, drivers and poles. Include complete product model number with all options as specified. Submittal shall be arranged with luminaires listed in ascending order, and with each luminaire's, LED light engine, driver, or pole information following luminaire's product data. Failure to organize submittal in this manner will result in the submittal being rejected.
  - 2. Submit lens product data, dimensions and weights if not included in product data sheet submittal.
  - 3. Include outline drawings, support points, weights, and accessory information for each luminaire.
  - 4. Submit manufacturer origin of LED chipset and driver.
- C. LED Lighting - Performance Testing Submittal (when requested by Architect/Engineer):
  - 1. IESNA LM-79: Include photometric report for the latest generation system being furnished. Provide name of independent testing laboratory, report number, date of test, luminaire series/model number, input wattage, and light source specifications.
- D. Submit utility rebate forms where offered at project location. Submit completed rebate forms within 30 days of Substantial Completion.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site. Store and protect under provisions of Section 26 05 00.
- B. Protect luminaire finishes, lenses, and trims from damage during storage and installation. Do not remove protective films until construction cleanup within each area is complete.

#### 1.6 WARRANTY

- A. The warranty period begins at the date of Substantial Completion.
- B. LED Light Engines and Drivers:

1. LED Drivers and Dimming Drivers: Five (5) years
  2. Light Emitting Diode (LED) Light Engines: Five (5) years
- C. Emergency Lighting Units and Exit Signs:
1. Emergency Lighting Units: Three (3) year, non-prorated
  2. Exit Signs: Three (3) year, non-prorated
  3. Emergency Unit and Exit Sign Battery: Sealed lead acid or lead calcium cell, requiring no maintenance or replacement for ten (10) years under normal conditions.
- D. Emergency Drivers:
1. Emergency LED Driver: Five (5) years
- E. Emergency Inverter for LED Light Engines:
1. Emergency Inverter and Battery: Sealed nickel cadmium five (5) year, non-prorated.
- F. Automatic Load Control Relay (ALCR): Five (5) year
- 1.7 REGULATORY REQUIREMENTS
- A. Conform to NFPA 101 for installation requirements.

## PART 2 - PRODUCTS

### 2.1 INTERIOR LUMINAIRES AND ACCESSORIES - GENERAL

- A. Lensed Troffers: Provide hinged frames with latches and 0.125-inch thick virgin acrylic lenses. Prismatic lenses shall have depth of no less than 0.080", KSH12 or equal. Other lenses as scheduled.
- B. Recessed Luminaires: Confirm ceiling and wall type and furnish trim and accessories necessary to permit proper installation in each system. Where fire-rated ceiling or wall assemblies are specified, furnish and install listed enclosures around luminaires that maintain the system rating.
- C. Luminaires: Louvers shall be anodized low iridescent specular aluminum with mitered corners and interlocking construction.
- D. Suspended Luminaires: Coordinate power feed and suspension canopies with ceiling type and architectural RCP for proper fit and location. Ensure finished installations are plumb and level at elevations specified. Verify suspension length prior to submittal.
- E. Painted reflector surfaces shall have a minimum reflectance of 90%.

- F. All painted components shall be painted after fabrication.
- G. Where indicated on drawings, provide wire guards for luminaires to protect against damage and vandalism. Wire guards shall be constructed of durable coated steel wire.

## 2.2 LIGHT EMITTING DIODE (LED) LUMINAIRE SYSTEMS

- A. Light emitting diodes used in interior applications shall match existing or as shown on drawings. Light emitting diodes used in exterior applications shall have a minimum color rendering index (CRI) of 70. Color temperature of the luminaires shall be as noted on the luminaire schedule.
- B. Refer to the luminaire schedule for color temperature and minimum color rendering index CRI requirements. Provide light source color consistency by utilizing a binning tolerance within a maximum 3-step McAdam ellipse unless noted otherwise.
- C. Rated life shall be minimum of 50,000 hours at L70.
- D. LED chips shall be wired so that failure of one chip does not prohibit operation of the remainder of the chip array.
- E. Luminaire delivered lumens is defined as the absolute lumens per the manufacturers LM-79-08 test report.
- F. LED luminaires shall be designed for ease of component replacement including modular replaceable boards or Zhaga sockets. Luminaires that are factory sealed and do not have field replaceable parts shall provide a 10-year warranty.
- G. LED light engine shall have a maximum LLD of 0.85 at 50,000 hours at 25°C ambient.
- H. LED Driver:
  - 1. Solid state driver with integral heat sink. Driver shall have over-heat, short-circuit and overload protection, power factor 0.90 or above and maximum total harmonic distortion of 10%. Driver shall have a voltage fluctuation tolerance of +/- 10%.
  - 2. Drivers shall have dimming capabilities as outlined in the luminaire schedule for each luminaire type. Dimming shall control light output in a continuous curve from 100% to 10% unless noted otherwise.
  - 3. Driver shall have a minimum of 50,000 hours rated life.
  - 4. Driver shall be tested to ANSI C82-16 for input current inrush, total harmonic distortion (THD), and power factor. Driver start time shall be less than 0.5 seconds to 98% of initial light output. Flicker should be less than 30% throughout the operating range.
  - 5. Driver shall be field replaceable without removal of the luminaire.
  - 6. Class A sound rating; inaudible in a 27 dBA ambient.
  - 7. Demonstrate no visible change in light output with a variation of plus or minus 10 percent change in line-voltage input.

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## 2.3 LED EMERGENCY LIGHTING UNITS

- A. Self-Powered Emergency Lighting Units: One-piece, self-contained unit with sealed, maintenance-free nickel cadmium battery, automatic charger and electronic circuitry. Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
- B. Charger: Dual-rate solid state charger, capable of maintaining the battery in a full-charge state during normal conditions, and capable of recharging discharged battery to full charged within 168 hours. Low voltage disconnect to prevent deep discharge of battery.
- C. LED Lamp Wattage: As scheduled on luminaire schedule.
- D. Remote Lamps: Match LED lamps on unit.
- E. Indicators: Provide lamps to indicate AC ON and RECHARGING.
- F. Provide test switch to transfer unit from normal supply to battery supply.
- G. Electrical Connection: Knockout for conduit connection.
- H. Unit Voltage: Refer to luminaire schedule volts, AC.
- I. Self-Diagnostics and Testing:
  - 1. Unit shall be self-diagnostic with continuous monitoring of charger performance and battery voltage. Any malfunction of battery, charger, transfer circuit, or emergency lamps shall be detected and visually indicated.
  - 2. Unit shall be programmed to exercise the battery and test emergency operation by performing a five-minute discharge/diagnostic cycle every six months. A manual test switch shall allow a five-minute discharge/diagnostic test at any time.

## 2.4 EMERGENCY EXIT SIGNS

- A. Self-Powered Exit Signs: Stencil face, 6-inch high letters, directional arrows as indicated, universal mounting type as indicated on the drawings. One-piece, self-contained unit with sealed, maintenance-free nickel cadmium battery, test switch, AC ON pilot light, automatic charger, and electronic circuitry. Power failure relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
- B. Directional Indicators: The directional indicator for exit signage shall be of a chevron type meeting all requirements of NFPA 101.
- C. Self-Diagnostics and Testing:

1. Unit shall be self-diagnostic with continuous monitoring of charger performance and battery voltage. Any malfunction of battery, charger, transfer circuit, or emergency lamps shall be detected and visually indicated.
2. Unit shall be programmed to exercise the battery and test emergency operation by performing a five-minute discharge/diagnostic cycle every six months. A manual test switch shall allow a five minute discharge/diagnostic test at any time.

## 2.5 EMERGENCY INVERTER FOR LED LIGHT ENGINES (INDIVIDUAL LUMINAIRES - INTEGRAL)

- A. Unit: Self-contained, with automatic transfer to battery supply on loss of normal power, UL 924 listed for factory or field installation, indoor and damp locations, 32°F to 122°F operating temperature. Compatible with switched, dimmed, and unswitched lighting controls. Compatible with LED light engines. The inverter output shall be sinusoidal with solid-state low voltage disconnect circuit.
- B. Battery: Sealed, high temperature, maintenance free, nickel cadmium battery with capacity to provide 90 minutes of emergency operation at full lumen and wattage output, with 24-hour recharge time. Refer to Luminaire Schedule for lumen and wattage requirements.
- C. Features: Integral battery charger with LED charging indicator light, test switch, electronic circuitry for use with LED drivers. Test and monitor switch shall be integral to luminaire.
- D. Factory and Field Installation: Listed for installation inside and adjacent to luminaire. Refer to Luminaire Schedule for individual luminaire requirements. Remote-mounted units shall be located above finished ceiling, adjacent to luminaire, and accessible from below through luminaire opening.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Securely fasten luminaires to the listed and labeled ceiling framing member by mechanical means such as bolts, screws, rivets or listed clips identified for use with the type of ceiling framing members. The architectural ceiling framing system may be used in lieu of independent support with prior written approval by the ceiling system manufacturer and Authority Having Jurisdiction (AHJ). Luminaires and wiring installed in fire-rated ceiling assemblies shall be independently supported for all applications.
  1. Install recessed flanged luminaires to permit removal from below. Use manufacturer-supplied plaster frames and swing gate supports. Provide independent support as follows:
    - a. Luminaires less than 56 lbs: Provide a minimum of two (2) #12 gauge suspended ceiling support wires located on diagonal corners of the luminaires.

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- b. Luminaires 56 lbs or greater: Provide a minimum of four (4) #12 gauge suspended ceiling support wires located on diagonal corners of the luminaires. Support luminaire independent of the ceiling system.
  - c. Luminaires larger than eight square feet (8 ft<sup>2</sup>): Support luminaire independent of the ceiling system.
- B. Do not fasten luminaire supports to piping, ductwork, mechanical equipment, or conduit, unless otherwise noted. Support wires shall be tightly wrapped (minimum of three turns within 3 inches of the connection) and sharply bend to prevent vertical movement.
  - C. Support suspended or pendant mounted luminaires independent of ceiling grid with adjustable stainless steel aircraft cables or per luminaire schedule mounting requirements. Suspension assembly and anchors shall be capable of supporting 300 pounds dead load at each suspension point.
  - D. Support wire used to independently support luminaires, raceways, and wiring systems shall be distinguishable from ceiling support systems by color (field paint), tagging or equivalent means.
  - E. Install lamps in lamp holders of luminaires.
  - F. Recessed luminaires and other optical accessories shall remain in protective wraps or films until construction in area is complete and area has been cleaned.
- 3.2 EMERGENCY LIGHTING UNITS AND EXIT SIGNS
- A. Install units plumb and level.
  - B. Aim directional lamp heads as directed.
  - C. Test emergency lighting equipment for 60 minutes to determine proper operation, prior to Substantial Completion. Provide electronic copy of periodic test log form to Owner's Representative. Explain and instruct Owner's Representative of requirements for testing and maintenance. Refer to latest adopted NFPA 101 for testing and logging requirements.
- 3.3 RELAMPING
- A. Replace failed LED light engine modules or arrays at completion of work.
- 3.4 ADJUSTING AND CLEANING
- A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.
  - B. Touch up luminaire and pole finish at completion of work.

### 3.5 OWNER TRAINING

- A. Test emergency lighting equipment for 60 minutes to determine proper operation, prior to Substantial Completion, with the Owner's Representative.
- B. Provide electronic copy of periodic test log form to Owner's Representative. Explain and instruct Owner's Representative of requirements for testing and maintenance. Refer to latest adopted NFPA 101 for testing and logging requirements.

END OF SECTION

## SECTION 28 31 02 - FIRE ALARM AND DETECTION SYSTEMS PERFORMANCE BASED

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. The fire alarm and detection system shall be included as a deferred submittal package.
- B. Performance-based designs shall be submitted to the Authority Having Jurisdiction (AHJ) for review and approval in a format acceptable to the approving authority. The submittal shall include documentation for each system function, performance objective, integration with other system(s), and design configuration. Documentation shall also include design calculations for system batteries, voltage drop, and other AHJ-requested items. The AHJ shall act as the sole authority for approval and shall approve all applicable modifications/variations to the design prior to installation.
- C. The fire alarm and automatic detection systems shall be designed, stamped, programmed, submitted for approval, installed, tested, and commissioned as a turnkey solution by the Contractor. Contractor shall be responsible for the coordination and interface of other systems.
- D. The contract documents define the minimum fire alarm system requirements. The most stringent requirement/interpretation shall apply when there is a discrepancy among the contract documents, code-minimum requirements, and the interpretation of the AHJ.

#### 1.2 RELATED WORK

- A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

#### 1.3 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in smoke detection and fire alarm systems with ten years' experience.
- B. Installer: A factory-authorized electrical or security contractor licensed with the State and local jurisdiction with five years' experience in the design, installation and maintenance of fire alarm systems by that manufacturer.
- C. Qualifications: The person managing/overseeing the preparation of shop drawings and the system installation/programming/testing shall be trained and certified by the system manufacturer and shall be Fire Alarm Certified by NICET, minimum Level 3. This person's name and certification number shall appear on the start-up and testing reports.

#### 1.4 REFERENCES

- A. NFPA 70 - National Electrical Code (NEC)

- B. NFPA 72 - National Fire Alarm and Signaling Code
- C. NFPA 101 - Life Safety Code
- D. UL 2017 - General Purpose Signaling Devices and Systems
- E. UL 217 / 268 - Standard for Smoke Alarms / Smoke Detectors for Fire Alarm Systems
- F. UL 2572 - Control and Communication Units for Mass Notification Systems

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 26 05 00.
- B. Store and protect products under provisions of Section 26 05 00.

#### 1.6 REGULATORY REQUIREMENTS

- A. System: UL or FM Global listed.
- B. Conform to requirements of NFPA 101.
- C. Conform to requirements of Americans with Disabilities Act (ADA).
- D. Conform to UL 864 Fire Alarm, UL 1076 Security, UL2017 General Signaling, and UL 2572 Mass Notification Communications.

#### 1.7 CODES, LAWS, AND ORDINANCES

- A. The fire alarm design shall comply with the following applicable codes, laws, and standards:
  - 1. Michigan Building Code MBC 2021
  - 2. IFC 2021 International Fire Code
  - 3. NFPA 72 National Fire Alarm & Signaling Code 2019
  - 4. Michigan Electrical Code MEC 2023
  - 5. Conform to all requirements of State of Michigan codes, laws, ordinances and other regulations having jurisdiction.

#### 1.8 SYSTEM DESCRIPTION

- A. Performance Statement: This specification section and the accompanying fire alarm specific design documents describe the minimum material quality, required features, and operational requirements of the system. These documents do not convey every wire that must be installed and every equipment connection that must be made. Based on the equipment described and the performance required of the system, as presented in these documents, the Vendor and the Contractor are solely responsible for determining all wiring, programming and miscellaneous equipment required for a complete and operational system.

- B. This section of the specifications includes the furnishing, installation and connection of the microprocessor controlled, intelligent reporting, fire alarm equipment required to form a complete coordinated system that is ready for operation. It shall include, but is not limited to, alarm initiating devices, annunciators, and wiring as indicated on the drawings and specified herein.
  - C. Extending the Existing Fire Alarm System: The existing control panel shall remain and shall be operational throughout construction. The system shall only be disabled to make new connections and to modify the programming. A fire watch shall be provided for all areas affected during outages. All system outages must be scheduled with the Owner at least one week prior. Individual devices may be disabled as needed based on construction activities to reduce the potential for false alarms, but all devices must be operational when the Contractor is not physically on site. New initiating devices may be connected to the existing signaling line circuits where capacity is available. Provide additional signaling line circuits as needed based on existing and new device quantity, including replacement of existing panel components. Provide new notification circuits to serve the new devices, including all necessary power supplies, amplifiers, batteries, and 120-volt input circuits. All new devices shall be programmed to provide the same sequence of operation as the existing devices of the same type, unless noted otherwise.
  - D. Fire Alarm System: NFPA 72; Automatic and manual fire alarm system, non-coded, analog-addressable with automatic sensitivity control of certain detectors, multiplexed signal transmission.
  - E. System Supervision: Provide electrically supervised system, with supervised Signal Line Circuit (SLC) and Notification Appliance Circuit (NAC). Occurrence of single ground or open condition in initiating or signaling circuit places circuit in TROUBLE mode. Component or power supply failure places system in TROUBLE mode.
  - F. Alarm Reset: Key-accessible RESET function resets alarm system out of ALARM if alarm initiating circuits have cleared.
  - G. Lamp Test: Manual LAMP TEST function causes alarm indication at each zone at fire alarm control panel and at annunciator panels.
  - H. Drawings: Only device layouts and some equipment have been shown on the contract drawings. Wiring and additional equipment to make a complete and functioning system has not been shown, but shall be submitted on the shop drawings.
- 1.9 SYSTEM DESIGN CRITERIA
- A. Audio Notification: Horn, chime, or voice based (match existing); full coverage
  - B. Visual Notification: Full coverage
  - C. Full coverage is defined as all occupiable interior spaces.

- D. Partial coverage is defined as all commonly occupied spaces including corridors, lobbies/waiting, toilets/restrooms, open office areas, meeting rooms, common work spaces, storage, mechanical/electrical spaces, and stairways.

#### 1.10 AUTOMATIC DETECTION DESIGN CRITERIA

- A. Smoke Detectors: Environmentally conditioned spaces not susceptible to dirt and dusty conditions.

#### 1.11 PROJECT RECORD DOCUMENTS

- A. Submit documents under the provisions of Section 26 05 00.
- B. Include location of end-of-line devices.
- C. Submit test results of sound pressure level (dBA) and intelligibility (STI) with the rooms tested designated on the floor plan. Notification devices shall have the tap wattage designated.

#### 1.12 OPERATION AND MAINTENANCE DATA

- A. Submit data under provisions of Section 26 05 00.
- B. Include operating instructions, and maintenance and repair procedures.
- C. Include results of testing of all devices and functions.
- D. Include manufacturer's representative's letter stating that system is operational.
- E. Include shop drawings as reviewed by the Architect/Engineer and the local Authority Having Jurisdiction.

#### 1.13 WARRANTY

- A. Provide one (1) year warranty on all materials and labor from Date of Substantial Completion.
- B. Warranty requirements shall include furnishing and installing all software upgrades issued by the manufacturer during the one (1) year warranty period.

### PART 2 - PRODUCTS

#### 2.1 WIRE GUARDS

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, or other device requiring protection.
  - 1. Factory fabricated and furnished by device manufacturer.

- 
2. Finish: Paint of color to match the protected device.

## 2.2 WIRING

- A. Fire alarm wiring/cabling shall be furnished and installed by the Contractor in accordance with the manufacturer's recommendations and pursuant to National Fire Codes. Cabling shall be UL listed and labeled as complying with the Electrical Code for power-limited fire alarm signal service.
- B. Fire Alarm Cable:
  1. Manufacturers:
    - a. Comtran Corp.
    - b. Helix/HiTemp Cables, Inc.
    - c. Rockbestos-Suprenant Cable Corp.
    - d. West Penn Wire/CDT.
    - e. Radix.

## PART 3 - EXECUTION

### 3.1 SEQUENCES OF FIRE ALARM OPERATION

- A. Audible Alarms Sequence:
  1. Match existing.
- B. Visual Alarms Sequence:
  1. Match existing.

### 3.2 INSTALLATION

- A. Install system in accordance with manufacturer's instructions and referenced codes.
- B. Devices:
  1. General:
    - a. All ceiling-mounted devices shall be located where shown on the reflected ceiling and floor plans. If not shown on the reflected ceiling or reflected floor drawings, the devices shall be installed in the relative locations shown on the floor drawings in a neat and uniform pattern.
    - b. All devices shall be coordinated with luminaires, diffusers, sprinkler heads, piping and other obstructions to maintain a neat and operable installation. Mounting locations and spacing shall not exceed the requirements of NFPA 72.

- c. Where the devices are to be installed in a grid type ceiling system, the detectors shall be centered in the ceiling tile.
  - d. The location of all fire alarm devices shall be coordinated with other devices mounted in the proximity. Where a conflict arises with other items or with architectural elements that will not allow the device to be mounted at the location or height shown, the Contractor shall adjust location of device so that new location meets all requirements in NFPA 72 and all applicable building codes.
2. Per the requirements of NFPA, detector heads shall not be installed until after the final construction cleaning unless required by the local Authority Having Jurisdiction (AHJ). If detector heads must be installed prior to final cleaning (for partial occupancy, to monitor finished areas or as otherwise required by the AHJ), they shall not be installed until after the fire alarm panel is installed, with wires terminated, ready for operation. Any detector head installed prior to the final construction cleaning shall be removed and cleaned prior to closeout.

C. Wiring:

1. Fire alarm wiring/cablings shall be provided by the Contractor in accordance with the manufacturer's recommendations and pursuant to National Fire Codes.
2. Refer to Identification Section 26 05 13 for color and identification requirements.
3. Wiring shall be installed in conduit from device to above accessible ceilings. Exposed plenum-rated cable (FPLP) shall be used above accessible ceilings supported every 4 feet or run in cable trays (if applicable) maintaining a minimum of 5-inches clearance from all lighting ballasts. Fire alarm cabling shall not be installed in the same bridge rings or cable trays designated for the cabling of other systems.
4. All junction boxes with SLC and NAC circuits shall be identified on cover. Refer to Identification Section 26 05 13 for color and identification requirements.
5. Partial evacuation or relocation of occupants is the standard operating procedure for this facility in the event of an alarm. Therefore, all notification appliance circuits (NAC), including circuits serving NAC extender panels (NAC) and other network communication circuits, must be installed and protected in accordance with the "circuit survivability" requirements described in NFPA 72. Contractor shall maintain the following:
  - a. NACs serving separate evacuation signaling zones shall be routed separately such that they are no less than 4 feet apart when run horizontally and 1 foot apart when run vertically. They may come simultaneously only within 10 feet of the control panel.
  - b. NACs passing through other evacuation signaling zone(s) shall be installed in conduit and routed through the 2-hour fire-rated chase(s) or enclosure(s) identified on the drawings.
  - c. NACs passing through other evacuation signaling zone(s) shall be Electrical Code classified CIC cable (Fire Alarm Circuit Integrity) installed in conduit. Provide CIC cable meeting UL requirements for 2-hour listing.

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- 1) The CIC cable system shall be installed in a conduit system meeting all requirements of its UL-listed installation system (conduit, boxes, connectors, etc.).
6. Fire Alarm Power Branch Circuits: Building wiring as specified in Section 26 05 13.
  7. Notification Appliance Circuits shall provide the features listed below. These requirements may require separate circuits for visual and audible devices.
    - a. Fire alarm temporal audible notification for all audio appliances.
    - b. Synchronization of all visual devices where two or more devices are visible from the same location.
    - c. Ability to silence audible alarm while maintaining visual device operation.
    - d. Emergency communication alert and textual visible appliance notification.
  8. Notification Appliance Circuits shall not span floors or smoke compartments.
  9. Signal line circuits connecting devices shall not span floors or 2-hour smoke compartments.
  10. Signal line circuits connecting devices shall be provided with an isolation module at each floor separation or as otherwise shown on the drawings.
  11. No wiring other than that directly associated with fire alarm detection, alarm or auxiliary fire protection functions shall be in fire alarm conduits. Wiring splices shall be avoided to the extent possible, and if needed, they shall be made only in junction boxes, and enclosed by plastic wire nut type connectors. Transposing or changing color coding of wires shall not be permitted. All conductors in conduit containing more than one wire shall be labeled on each end, in all junction boxes, and at each device with "E-Z Markers" or equivalent. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its terminal. Cabinet terminals shall be numbered and coded, and no unterminated conductors are permitted in cabinets or control panels. All controls, function switches, etc. shall be clearly labeled on all equipment panels.
- D. Fire Alarm Cabling Color Code: Provide circuit conductors with insulation color coding as follows, or using colored tape at each conductor termination and in each junction box.
1. Power Branch Circuit Conductors: In accordance with Section 26 05 53.
  2. Signaling Line Circuit: Overall red jacket with black and red conductors.
  3. DC Power Supply Circuit: Overall red jacket with violet and brown conductors.
  4. Notification Appliance Circuit: Overall red jacket with blue and white conductors.
  5. Door Release Circuit: Gray conductors.
  6. Central Station Trip Circuit: Orange conductors.
  7. Central Station Fire Alarm Loop: Black and white conductors.
- E. Devices surface mounted in finished areas shall be mounted on surface backboxes furnished by fire alarm equipment supplier. Backboxes shall be painted to match device, shall be the same shape and size as the device shall not have visible knockouts.

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- F. Make conduit and wiring connections to door release devices, sprinkler flow and pressure switches, sprinkler valve monitor switches, fire suppression system control panels, duct analog smoke detectors and all other system devices shown or noted on the Contract Documents or required in the manufacturer's product data and shop drawings.

### 3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 26 05 00.
- B. Test in accordance with NFPA 72, Chapter 14 and local fire department requirements. Submit documentation with O & M manuals in accordance with Section 14.6 of the Code.
- C. Contractor shall test and adjust the fire alarm system as follows:
1. Speaker taps shall be adjusted to the lowest tap setting which achieves a sound level higher than or equal to the greatest of the following:
    - a. 70dBA.
    - b. 15 dBA above ambient levels as indicated in NFPA 72 Table A.18.4.3.
    - c. 15 dBA above measured ambient. 5 dBA above the maximum measured sound level with duration of more than 60 seconds.
    - d. As specified on the drawings.
  2. Sound level measurement procedure shall meet the following requirements:
    - a. All measurements shall use the 'A' weighted, dBA, sound measurement scale.
    - b. All measurements shall be taken after furnishings, wall coverings and floor coverings are in place.
    - c. All measurements shall be taken after fixed equipment (HVAC units, etc.) producing ambient noise is installed and is in operation.
    - d. Final ambient sound measurements shall be taken during occupancy and the units shall be re-adjusted at that time, if necessary.
    - e. All sound level measurements shall be taken at a height of 5' above the finished floor level.
    - f. Measurements shall be taken in every unique room. If there are multiple rooms, which have the identical dimensions and function, 10%, or a minimum of 2 rooms shall be tested. The results from the rooms tested shall be averaged and the remaining rooms may be adjusted per the average.
    - g. Measurements shall be taken on a 20' x 20' grid and the results for all points taken shall be averaged. If the room is smaller than 20' x 20' a minimum of two measurements are required.
    - h. Measurements shall be taken halfway between speakers or halfway between a speaker and the wall. No measurements shall be taken at the extreme edges of the room, nor directly under speakers.

### 3.4 MANUFACTURER'S FIELD SERVICES

- A. Provide manufacturer's field services under provisions of Section 26 05 00.
- B. Include services of certified technician to supervise installation, adjustments, final connections, and system testing.
- C. Note that room numbers depicted on the architectural/engineering drawings will not necessarily reflect the actual room (signage) numbers that the Owner selects. The Contractor and fire alarm manufacturer shall coordinate the actual room numbers as the Owner directs to identify each device. This list shall be a part of the floor plan record drawing to be turned in at the project closeout.

END OF SECTION

