# SPECIFICATIONS

## UNICOR Elevator Modernization

**Unicor, FPI Central Office**
**400 1st St NW**
**Washington DC 20534-0004**

**May 27, 2026**

RFS Architects
ARCHITECTURE ▪ PLANNING ▪ INTERIORS

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# SECTION 011000 – SUMMARY

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Contractor's use of site and premises.
3. Work restrictions.
4. Specification and Drawing conventions.
5. Miscellaneous provisions.

### 1.2 PROJECT INFORMATION

A. Project Name and Location: UNICOR Elevator Modernization, at the UNICOR Central Office, 400 First St., NW Washington, DC, 20534-0004.

B. Project Summary Description: The work involves the modernization of three passenger elevators and one service elevator in the existing 8-story office building. The work includes, but is not limited to: demolition, cutting and patching, concrete, masonry, a new exterior steel stair, firestopping, metal doors, finishes, elevator work, plumbing, mechanical, fire protection, electrical and related work.

C. Architect: The term Architect refers to the project designer. The project was designed by: RFS Architects, pc. 261 West Bute St. Norfolk, VA 23510. The Architect's representative is Robert D. Stern, AIA (757) 627-2791.

D. Drawings: Drawings that will be enumerated in the Owner/Contractor Agreement as part of the Contract Documents are listed in the Index of Drawings page of the separately bound drawing set titled "UNICOR ELEVATOR MODIFICATIONS", revision dated May 27, 2026.

E. Project Delivery Method: Single prime contract.

F. Key Consultants are:

1. Greenman- Pedersen, Inc. – Structural, fire protection, plumbing, mechanical, and electrical systems.

    a. Representative: John Murphy, PE. (570) 880-7348.

2. Intertek/PSI - Asbestos abatement.

    a. Representative: Andrew Sailo (240) 425-3452.

3. James Lawrence & Associates, LLC, Inc.- Elevator Consultant

a. Representative: Mathew Lawrence, CEI (804) 747-0971.

## 1.3 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Driveways, Walkways and Entrances: Keep driveways, parking areas, and entrances serving premises clear and available to emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

      a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

C. Condition of Existing Grounds: Maintain portions of existing grounds, affected by construction operations throughout construction period. Repair damage caused by construction operations.

## 1.4 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

   1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 8:00 a.m. to 4:30 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:

   1. Notify Owner not less than two days in advance of proposed utility interruptions.
   2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, and odors.

E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site on Owner's property is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

## 1.5 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and as published as part of the U.S. National CAD Standard.

## 1.6 MISCELLANEOUS PROVISIONS

A. Work in existing facilities shall correspond in all respects with the existing conditions to which it connects, or to similar existing conditions, in materials, workmanship and finish.

B. Alterations to Existing Conditions: Existing conditions shall be cut, drilled, removed, temporarily removed, or removed and replaced, as necessary for performance of Work under the Contract. Work out of alignment where exposed by removal of existing work shall be called to the attention of the Owner. Necessary corrective work shall be as directed.
1. Replacements of existing conditions that are removed shall match similar existing conditions.
2. Unless otherwise indicated, existing structural members shall not be cut or altered without authorization by the Contracting Officer.
3. Conditions remaining in place, which are damaged or defaced during the Work, shall be restored to the condition existing at time of award of Contract.

4. Discolored or unfinished surfaces exposed by removal of existing conditions, that are indicated to be final exposed surfaces, shall be refinished or replaced as necessary to produce uniform and harmonious contiguous surfaces.

PART 2 - EXECUTION (Not Applicable)

END OF SECTION 011000

# SECTION 011400 – WORK RESTRICTIONS

## PART 1 - GENERAL

### 1.1 CONTRACTOR USE OF PREMISES

A. The Contractor will review and document the existing conditions surrounding the project premises. Provide documentation to the Government prior to the commencement of any construction activity.

B. The Contractor shall limit use of the premises to the work in areas indicated, and to allow for Government occupancy and public use.

1. Confine operations at the site to areas indicated. Do not disturb portions of the site beyond the areas in which Work is indicated.
2. Schedule deliveries to minimize space and time requirements for storage of material and equipment on site. UNICOR staff will not accept deliveries for the Contractor.
3. Maintain existing building in a safe and weather-tight condition throughout the construction period. Provide temporary covers over roof openings. Repair damage caused by construction operations to the satisfaction of the government. Take precautions to protect the building, its occupants and the public during the construction period. A representative of the Contractor shall be available to arrive on site within one (1) hour of notice should an emergency occur.
4. Keep building interior and site areas free from accumulation of waste material, rubbish, construction debris and construction materials. Construction and demolition debris shall be removed from the site daily.
5. Limited exterior space on the site is available for the Contractor's storage trailers and related activities, provided that its use will not interfere with operations of the Government. Use of the existing loading dock facilities or elevators is not permitted. Materials shall be hoisted to the roof from the exterior. Existing materials and equipment that are removed as part of the construction operations, and that are not reused or designated to be salvaged as Government property, shall become the property of the Contractor and shall be removed from the site daily. Storage or sale of excess salvageable materials and equipment is not permitted on site.
6. Pollution producing equipment shall not be located near air intakes where airborne smoke or fumes could be drawn into the building. When not required for powering unloading operations, turn off engines when docked. Vents and air intakes are to be covered throughout construction producing dust or fumes (including 0 VOC emitting products).
7. Smoking is not permitted in or around the building.
8. Limited parking will be available on site for the Contractor and Contractor's employees.
9. No apparatus with an open flame is allowed to be used within the facility without the prior receipt of a burn permit. Burn permits are required for each separate occurrence.
10. The work shall be sequenced to minimize disruption to building occupants, visitors, and maintenance activities. To the greatest extent feasible, demolition work should not take place until supplies are on hand to perform new work.
11. Coordinate with the Building Manager for site access.
12. Coordinate with the Building Manager on correct response procedures for any building system alarms occurring during or resulting from the construction process.

13. All building systems outside the immediate construction area shall be kept fully operational. Coordinate with the Building Manager to schedule in advance (72-hours notice) when limited shutdowns are required to perform the work. Outages of the HVAC systems shall be performed during non- occupied hours.
14. Protect building site from flying debris. Prevent materials, tools, or debris from falling off the roofs to the ground below.

WORKING HOURS

A. Government Occupied Hours: Government personnel are scheduled to occupy the building during the following hours on weekdays, Monday through Friday, except for established Government Holidays: 6:00 AM to 6:00 PM.

B. Contractor's General Working Hours: The Contractor working hours shall be generally established to occur 8:00 am to 4:00 pm, Monday through Friday.

C. Contractor's Required Working Hours: The following work shall be performed after 4:00 pm and before 8:00 am, Monday through Friday, and on weekends.

   1. Noisy (62 dbA or higher) and/or odor-producing work that may disrupt operations in adjacent spaces.

D. Work accomplished during Contractor's Required Working Hours shall be performed at no additional cost to the Government. Contractor shall submit a proposed schedule and gain the Contracting Officer's approval at least 72 hours before proceeding with any work after 4:00 pm and before 8:00 am, Monday through Friday, and on weekends.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011400

# SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This section includes certain administrative provisions for managing and coordinating construction operations, including but not limited to the following:

1. General project coordination.
2. Coordination drawings.
3. Administrative and supervisory personnel.
4. Conferences and meetings.
5. Utility service interruptions.
6. Cleaning and protection.

### 1.2 GENERAL PROJECT COORDINATION

A. Coordination of Trades: Coordinate construction operations included in the various sections of the Specifications to provide an efficient and orderly installation of each part of the Work. Coordinate construction operations included under different sections of the Specifications that depend on each other for proper installation, connection or operation. Keep pipes, ducts, conduit, and the like as close as possible to ceiling slab, walls, and columns to take up a minimum amount of space. Locate pipes, ducts, and equipment so that they do not interfere with the intended use of eyebolts and other lifting devices. Assure all controls can be reached and operated.

1. Schedule construction operations in the sequence required to obtain the best results where the installation of one part of the Work depends on installation of other components before or after that part.
2. Coordinate installation of different components to provide maximum accessibility for required maintenance, service, testing and repair.
3. Minimize roof penetrations.

B. Notification: Prepare and distribute memoranda to each party involved, outlining special procedures required for coordination. Include notices, reports and meeting minutes as part of the memoranda.

C. Administrative Procedures: Coordinate scheduling and timing of administrative procedures with other construction activities to avoid conflicts and promote orderly progress of the Work. Administrative procedures include but are not limited to the following:

1. Managing process of obtaining security clearances for access of contractor personnel.
2. Preparation of schedules.

3. Installation and removal of temporary facilities.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Project closeout activities.

## 1.3 COORDINATION DRAWINGS

A. Prepare coordination drawings and/or BIM model and data where coordination is needed for installation of products and materials fabricated by separate entities, and prepare coordination drawings where limited space availability necessitates maximum use of the space for efficient installation of different components.

1. Show the relationship of components from the separate shop drawings. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems
2. Indicate required installation sequences.
3. Indicate minimum access space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
4. Show locations and sizes of all access doors on vertical and horizontal surfaces throughout the facility.
5. Provide vertical and horizontal dimensions necessary to locate each component and avoid conflicts within the space.
6. Comply with shop drawing requirements for sheet size and submittal methods specified in Division 1 Section "Submittal Procedures."

B. Work installed prior to approval of coordination drawings shall be at the Contractor’s risk. Subsequent relocations required to avoid interferences shall be made without additional expense to the Government. In case interference develops, the Government will decide which work shall be relocated, regardless of which was installed first.

## 1.4 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. The Contractor shall provide administrative and supervisory personnel for proper performance of the Work.

## 1.5 CONFERENCES AND MEETINGS

A. Progress Meetings: The Government or designee shall conduct progress meetings at the Project Site. Dates of meetings shall be coordinated with preparation of the payment request.

1. Attendees: In addition to the Contractor's and Government's representatives, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

   a. Contractor's Construction Schedule: Review progress since the last progress meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Provide a two-week schedule look ahead.
   b. Review the present and future needs of each entity present, including but not limited to the following:

      1) Interface requirements.
      2) Time.
      3) Sequences of operations.
      4) Status of submittals.
      5) Deliveries.
      6) Off-site fabrication.
      7) Access.
      8) Temporary utility shutdowns.
      9) Site utilization.
      10) Temporary facilities and controls.
      11) Hours of work.
      12) Hazards and risks.
      13) Housekeeping and progress cleaning.
      14) Quality and work standards.
      15) Change Orders.
      16) Documentation of information for payment requests.
      17) Updating of Record Documents.

3. Schedule Updating: The Contractor shall revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. The revised schedule shall be issued concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Prior to installations, require the installer of each major component to inspect both the substrate and conditions under which work is to be performed.

   1. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Construction in Progress: Keep construction in progress, and adjoining materials in place, clean during handling and installation. Apply protective coverings where required for protection from damage or deterioration.

C. Completed Construction: Clean completed construction, and provide maintenance, as frequently as necessary to prevent damage or soiling or other deterioration through the remainder of the construction period. Adjust and lubricate operable components as necessary to assure operability without damage.

D. Limiting Exposures: Supervise construction operations to prevent exposure of any part of construction, completed or in progress, to harmful, dangerous, damaging or otherwise deleterious conditions during the construction period.

END OF SECTION 013100

# SECTION 013200 – CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This section includes the Contractor's Construction Schedule and certain other schedules and reports required for documenting the progress of construction during performance of the Work.

B. Coordinate the timing for preparation and processing of schedules and reports with the performance of other construction activities, and maintain a consistent and logical correlation between updated schedules and reports.

### 1.2 CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 10 days of date established for the Notice to Proceed.

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 three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2. Include time required for review of submittals and resubmittals, time required for tests and inspections by independent testing and inspecting agencies, and time required for Project closeout.

C. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.

D. Construction Schedule Updating: Submit an updated Contractor's Construction Schedule monthly.

### 1.3 REPORTS

A. Daily Construction Reports: Prepare electronic daily construction report recording the following information concerning but not limited to events at the site. Include:

1. List of subcontractors at the site.
2. List of separate contractors at the site.
3. Count of personnel at the site.
4. High and low temperatures, general weather conditions.
5. Accidents and near miss incidents.

6. Meetings and significant decisions.
7. Unusual events (see C. Unusual Event Reports below).
8. Stoppages, delays, shortages, and losses.
9. Orders and requests of governing authorities.
10. Change Orders received or implemented.
11. Equipment or system tests and startups.
12. Partial completions or occupancies.
13. Summary of all work performed.

B. Field Correction Reports: When the need to take corrective action requires a departure from the Contract Documents, prepare a detailed report. Include a statement describing the problem and recommended changes. Indicate reasons the Contract Documents cannot be followed. Within 7 Calendar days submit a copy to the Contracting Officer or Contracting Officer's representative for approval.

C. Unusual Event Reports: When an event of an unusual and significant nature occurs at the site, prepare a detailed report. List the chain of events, persons participating, response by the Contractor's personnel, evaluation of the results or effects, and similar pertinent information. Within 1 Calendar days submit a copy to the Contracting Officer or Contracting Officer's representative immediately. Advise the Contracting Officer or Contracting Officer's representative in advance when such events are known or predictable.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013200

# SECTION 013300 – SUBMITTAL PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes certain administrative and procedural requirements for shop drawings, coordination drawings, schedules, samples and certain other quality assurance submittals.

B. This section does not include requirements for the following submittals that are included in their specific sections:

1. Warranties specified in Division 1 Section "Product Requirements."
2. Operation, maintenance and instruction manuals specified in Division 1 Section "Operation and Maintenance Data."
3. Reports, schedules and other submittals specified in Division 1 Section "Construction Progress Documentation".

C. Shop drawings, coordination drawings and schedules are further categorized and defined as follows:

1. Shop drawings include drawings and schedules prepared for specific parts of the project, except for coordination drawings.
2. Product data includes manufacturer's standard catalogs, pamphlets and other printed materials that show and describe materials and items, and includes but is not limited to the following:

    a. Product specifications.
    b. Installation instructions.
    c. Color charts.
    d. Catalog cuts.
    e. Rough-in diagrams and templates.
    f. Wiring diagrams.
    g. Performance curves.
    h. Operational range diagrams.
    i. Mill reports.

D. Samples of actual materials and items shall be provided at such scale to allow delivery for review, as well as for field samples or mock-ups of full-size physical examples erected on-site or elsewhere, to establish a true-scale standard by which the corresponding work will be judged or a standard for compliance testing.

E. Other quality assurance submittals include materials specifically prepared for the project, except drawings and schedules, and include but are not limited to the following:

1. Design data and calculations.
2. Certifications of compliance or conformance.
3. Manufacturer's instructions and field reports.

F. Approvals do not supersede requirements of the contract documents.

## 1.2 GENERAL SUBMITTAL REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities and with the Submittal Schedule specified in Division 1 Section "Construction Progress Data". Transmit each submittal sufficiently in advance of the scheduled performance of related construction activities to avoid delaying the Work, allowing for the review times specified for submittals.

1. Coordinate each submittal with other submittals and related activities that require sequential scheduling, to allow for testing, purchase, fabrication and product delivery in a timely manner.
2. Schedule transmittal of different categories of submittals for the same element of Work and for different elements of related parts of the Work at the same time. Notwithstanding the foregoing sentence, the Contractor shall provide a complete submittal package for each Division of the specification so as to enable the Government to review the related sections together. Coordinate submittals to enable approvals and acceptances so as not to inhibit orderly progress of the Work.
3. Allow sufficient time for submittal review, corrections following the initial review, and re-submittal review before activities scheduled after the submittal approval.
4. Failure on the part of the Contractor to indicate approval or acceptance on submittals prior to submission to Contracting Officer will result in their being returned to the Contractor without being acted upon.
5. Any resubmission required after Government review shall be made within 10 calendar days after return of the submittal, unless specifically authorized otherwise by the CO.
6. Submittals which are determined to be incomplete or otherwise substandard will be returned to the Contractor with no further review. Delays due to incomplete or rejected submittals will not be excused.
7. Construction will not be allowed to proceed if submittals are not received in a timely manner, and will not result in an extension to the Contractor's Construction Schedule.
8. Failure by the Contractor to provide the required submittals in a timely manner may result in withheld payments until submittals are up-to-date.
9. Maintain one complete set of submittals at project site.
10. Maintain an organized submittal register at project site. This will be an agenda item for progress meetings.
11. The contractor to schedule and allow a minimum of 14 working days for the Architect/Engineer submittal review. The comment period initiates upon the receipt of the submittal by the office performing the primary review. The period commences upon issue of the submittal by the office performing the primary review.

B. Submittal Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble each submittal item into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each submittal item.
2. Name file with submittal number or other unique identifier, including revision identifier.

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by the CO.
4. Transmittal Form for Electronic Submittals: Use a form acceptable to the CO.

## 1.3 SHOP DRAWINGS AND COORDINATION DRAWINGS

A. Submit originally prepared information, drawn accurately to scale. Do not reproduce Contract Documents or copy standard printed materials as the basis for Shop Drawings and Coordination Drawings.

B. Include at minimum the following information on Shop Drawings and Coordination Drawings:

1. Dimensions.
2. Identification of products and materials.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurements.
6. Highlighted or encircled deviations from the Contract Documents.

C. Sheet size: Except for templates, patterns and similar full-size drawings, submit Shop Drawings and Coordination Drawings on sheets of at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).

D. Submittals: Unless otherwise indicated, submit one electronic file (.pdf) of each drawing submittal. The file will be marked with action taken and returned.

E. Distribution: When submittal is approved or accepted, Contractor shall prepare final electronic files, for the following purposes.

1. One file shall be marked and retained as a "Record Document."
2. Unless otherwise requested, one file shall be provided to the Contracting Officer.
3. Additional prints shall be provided to the entities involved in the construction.
4. Prints will be included in the Operation and Maintenance manuals.

## 1.4 PRODUCT DATA

A. Collect Product Data into a single submittal for each system or element of construction. Mark each copy to show specific product choices and options applicable to the project. Product Data shall include the following information, where applicable:

1. Manufacturer's printed recommendations.
2. Compliance with recognized trade association standards.
3. Compliance with recognized testing standards.
4. Applicability of testing agency labels and seals.
5. Notation of coordination requirements.

B. Submittals: Unless otherwise indicated, submit one electronic copy of each Product Data submittal.

C. Distribution: When submittal is approved or accepted, Contractor shall distribute copies for the following purposes:

1. One copy shall be marked and retained as a "Record Document."
2. Additional copies shall be provided to the manufacturers, subcontractors, suppliers, installers, governing authorities and others as required for performance of the applicable construction activities.
3. Copies required for operation and maintenance manuals

## 1.5 SAMPLES

A. Submit full-size, fully fabricated samples, cured and finished in the manner specified. Samples shall be physically identical to the material or product proposed for use.

B. Mount, display, or package samples to facilitate review of kind, color, pattern, texture and other qualities indicated, as a final check of these characteristics with other elements and for comparison of these characteristics with those of the actual component delivered and installed.

C. Where variation in color, pattern, texture or other characteristic is inherent in the material or product, submit at least 3 multiple units that show approximate limits of the variations.

D. Refer to other specification sections for requirements for samples that illustrate workmanship, fabrication techniques, and details of assembly, connections, operations and similar construction characteristics.

E. Refer to other specification sections for samples to be returned to the Contractor for incorporation in the Work. Such samples must be in undamaged condition at time of use.

F. Preliminary Submittal: Where color, pattern, texture or similar characteristics are specified to be selected from a manufacturer's range of standard choices, submit a preliminary single set sample of available choices prior to submittal of the complete sample. Preliminary submittal will be returned, with selection noted, for the Contractor's use in subsequent submittals.

G. Submittals: Unless otherwise indicated and except for field samples or mock-ups of full-size physical examples erected on-site or elsewhere, submit not less than three (3) sets of each sample submittal. One copy will be marked with action taken and returned. Comply with requirements in the individual specification section for field samples and mockups.

H. Distribution: Except for field samples or mockups, when submittal is approved, Contractor shall distribute approved copies for the following purposes:

1. One copy shall be marked and retained as a "Record Document" at the Project Site, and shall be available for comparison throughout the course of construction activity.
2. Additional copies shall be provided to manufacturers, subcontractors, suppliers, installers, governing authorities and others as required for performance of the applicable construction activities.

## 1.6 OTHER QUALITY CONTROL SUBMITTALS

A. Submit other quality control submittals in compliance with requirements in the individual specification sections, including Division 1.

B. Certifications: Submit notarized certifications indicating compliance with specified requirements. Certifications shall be signed by an individual authorized to sign on behalf of the Contractor.

## 1.7 REVIEW ACTION ON SUBMITTALS

A. For electronic submittals,

1. Submit electronic submittals as PDF electronic files.

a. The government will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

B. Compliance with specified characteristics is the Contractor's responsibility, and is not part of the Contracting Officer's review and indication of action taken. The contract documents shall prevail in case of review action conflict.

C. Submittals without approval or acceptance shall not be used.

D. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.

4. Submit Product Data before or concurrent with Samples.
5. Submit Product Data in the following format:

a. PDF electronic file.

# PART 2 - PRODUCTS (Not Applicable)

# PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013300

# SECTION 014000 – QUALITY ASSURANCE & CONTROL REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This section includes administrative and procedural requirements for quality assurance and quality control services.

B. Quality Assurance & Control: The Contractor is solely responsible for developing, implementing, and providing for all quality control and related processes in the Contractor's Quality Control Plan to ensure that all parts of the project meet or exceed all of the requirements as set forth in the Contract Documents.

1. The testing and inspections indicated in the Specifications (Testing) is a spot checking program identified by the AE per design or building code requirements, performed by an Independent Testing Agency (Agency), and is not intended as a portion of the Contractor's Quality Control Plan.
2. The presence of the Agency shall in no way relieve the Contractor of his obligation to perform the work in accordance with the Contract Documents.
3. The Testing indicated in the Specifications cannot be used to refute conditions of suspected poor quality noticed in the field.
4. In order to provide for a measure of the Contractor's quality control, the Government, either with its own employees or contractors, may continuously monitor the Contractor's quality control and related processes. This monitoring is not a part of the Contractor's Quality Control Plan.
5. To the extent that the Contractor fails or otherwise refuses or neglects to develop, implement, or provide for all quality control and related processes, the Government may, in addition to any other available remedies under the Contract, elect to perform quality assurance beyond that indicated in the Specifications and charge the Contractor for any and all costs related thereto.

C. Quality assurance and quality control include tests, inspections and related actions, including reports, performed by the Contractor, manufacturers, independent agencies or governing authorities.

1. These testing and inspection services are required for, products, customized fabrication and installation procedures as well as for items to be professionally designed by the Contractor (delegated design).
2. Product testing shall be done by a Nationally Recognized Testing Laboratory (NRTL) and National Voluntary Laboratory Accreditation Program (NVLAP), or other GSA approved testing facility.

D. The independent quality assurance testing and inspection (Testing) requirements for individual construction materials and activities are included in the Specification sections that specify those construction materials and activities.

E. Mock-ups: Full-size physical assemblies that are constructed on-site unless otherwise directed by the CO. Mock-ups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects as well as qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mock-ups may be done on the interior or exterior. Mock-ups are not Samples. Approved mock-ups establish the standard by which the Work will be judged.

F. Definitions

1. Source Quality Control Testing is done at the product source.
2. Field Quality Control Testing is done on site.

G. Testing and Inspection Reports: The Contractor, the Contractor's testing agency(ies) and the Agency, where they perform the services, shall submit a certified written report of each test, inspection or other quality control service. Maintain a log both of accepted and rejected reports including corrective actions taken and date of retesting and compliance. Paper Copies: The Agency shall send certified copies of test and inspection reports as specified to the following parties:

a. 1 hard copy to the Building Manager.
b. 1 electronic copy each to the CO and to the A/E.

1. Testing and inspection reports shall include but not be limited to the following:

a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the test or inspection.
f. Designation of the work and test method.
g. Identifications of product and specification section.
h. Complete test or inspection data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Certify whether tested or inspected Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

2. All quality operations shall within 24 hours notify, by personal contact and written notice, the CO's representative and the Contractor of irregularities or deficiencies observed in the Work during performance of their services.

3. All quality operations shall maintain a log of all their tests and inspections and a separate log of those that do not conform to the requirements of the Contract Documents. Both logs shall be published and reviewed weekly with the Contractor and the Government and/or at the weekly meeting.

## 1.2 RESPONSIBILITIES

A. Contractor Responsibilities: Unless specifically indicated otherwise, the Contractor shall provide the quality control services including those required by local jurisdictions.

1. Obtain copies of applicable codes, standards, procedures, regulations, etc. relative to materials, procedures, testing and inspection on the Project and make those available at the Project site for reference.

B. Contractor shall submit each testing agency's firm name, and credentials to perform the specified services, to the Government for approval at least 15 calendar days before scheduled inspections or tests.

C. Retesting: The Contractor is responsible for retesting, including repeated inspections and other services, where results of the initial quality control services indicate noncompliance. The Contractor shall be responsible for the Agency or an equally qualified agency for these services. If the Agency does not provide the retesting or inspection, the Contractor shall be responsible for having the Agency observe the testing and inspection work.

1. Tests for Suspected Deficient Work: If in the opinion of the Government, any of the work of the Contractor that does not appear to conform to requirements, the Contractor shall make the tests that the Government deems advisable to determine its conformance to the Contract Documents.
2. The government shall pay the costs if the tests prove the suspected work to be satisfactory.

D. Associated Services: The Contractor shall cooperate with others, including the Agency, performing tests, inspections and other quality services, and shall provide reasonable auxiliary services as requested. Contractor shall notify the testing and inspection entities sufficiently in advance of operations to permit their timely assignment of personnel. Auxiliary services include but are not limited to the following:

1. Provide access to the work and all documents (Contract documents, shop drawings, product data, Contractor and Sub-Contractor testing and inspections, etc.).
2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
3. Provide adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
4. Provide facilities for storage and curing of test samples and equipment.
5. Deliver samples to testing laboratories.
6. Provide security and protection of samples and test equipment at the Project site.

E. Duties of the Independent Testing Agency (Agency): The Agency engaged to perform tests, inspections and other quality services shall cooperate with CO's representative and the Contractor in performance of the Agency's duties.

1. The Agency shall provide qualified personnel to perform required inspections and tests.
2. The Agency shall provide certifications and a list of personnel assigned to each portion of the work.
3. The Agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
4. The Agency shall not perform any duties of the Contractor.
5. The Testing Agency’s proposal shall contain the outlined Testing based on a unit price basis for tests and inspections and on an hourly basis for personnel.

6. The Agency shall certify the test results and observations.
7. The Agency shall interpret whether or not their results and observations meet specified Project requirements.
8. The Agency shall submit reports per Section: Testing and Inspection Reports, above.
9. The Agency shall maintain logs per Section: Testing and Inspection Reports, above.
10. The Agency shall review the applicable certificates of the Contractor's personnel to verify the validity and current status of the certificate.
11. For construction personnel without necessary certificates, the Agency shall oversee the certification process of construction personnel to ensure their qualifications to perform the specified duties. The Contractor shall be responsible to the Agency for these services.
12. The Agency shall obtain and review the project plans and specifications with the Government as soon as possible prior to the start of construction.
13. The Agency shall attend preconstruction conferences to coordinate materials inspection and testing requirements with the planned construction schedule. The Agency shall participate in such conferences where the Testing is indicated throughout the course of the project.

F. Independent Testing Agency Payment: The Contractor shall obtain and include the Agency's cost in the Contract Sum.

G. Coordination: The Contractor shall coordinate the sequence of activities to accommodate required services with a minimum amount of delay.

1. Activities shall be coordinated to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
2. The Contractor shall be responsible for scheduling times for inspections, tests, taking samples and similar activities.

## 1.3 QUALIFICATIONS OF THE INDEPENDENT TESTING AGENCY (AGENCY) AND CONTRACTOR TESTING AGENCIES

A. A qualified independent testing agency shall be an accredited entity engaged to perform tests and inspections, both at the Project site or elsewhere and to report on and to interpret results of those tests or inspections. Testing agencies shall be acceptable to the CO and the Agency shall be authorized by authorities having jurisdiction to operate in jurisdiction where project is located.

B. Unless other accreditation is specifically specified in the applicable individual section, each testing agency shall be prequalified as complying with the American Council of Independent Laboratories "Recommended Requirements for Independent Laboratory Qualifications", or shall be recognized by the Occupational Safety and Health Administration (OSHA) in accordance with 29 CFR Part 1910.7 to test and approve equipment or materials for their safe intended use. Each testing agency shall specialize in the types of tests and inspections to be performed.

C. Testing agencies shall be authorized by authorities having jurisdiction to operate in the jurisdiction where the project is located. Testing agency qualifications: NRTL (Nationally Recognized Testing Laboratory) per 29 CFR 1910.7, and NVLAP (National Voluntary Laboratory Accreditation Program) per NIST., and documented per ASTM 329 and is acceptable to GSA

## 1.4 CONTRACTOR QUALITY CONTROL PLAN

A. Contractor's Quality-Control Plan: Submit within 15 days from NTP for quality-control activities and responsibilities. Submit in electronic format. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-control responsibilities. Coordinate with the construction schedule. The procedures, controls, inspections, and tests shall be indicated by specification section and shall include the specific actions that the Contractor's QC team will take to verify compliance of the work with the specifications and drawings.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those indicated in the Specifications.

1. Provide a project quality-control manager, who may also serve as Project Superintendent.
2. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
3. Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship. Indicate types of corrective actions to be required to bring work into compliance with standards established by the Contract requirements and approved mock-ups.

C. Other Reports

1. 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:

   a. Name, address, and telephone number of the technical representative making report.
   b. Statement on condition of substrates and their acceptability for installation of product.
   c. Statement that products at Project site comply with requirements.
   d. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   e. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   f. Statement if conditions, products, and installation will affect warranty.
   g. Other required items indicated in individual Specification Sections.

2. 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:

   a. Name, address, and telephone number of factory-authorized service representative making report.
   b. Statement that equipment complies with requirements.
   c. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   d. Statement if conditions, products, and installation will affect warranty.

e. Other required items indicated in individual Specification Sections.

3. Permits, Licenses, and Certificates: For the Government's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. Upon completion of testing, inspection, sample taking and other quality control services, repair damaged construction and restore substrates and finishes to like new conditions. Comply with the requirements of the Contract Document, including Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality control service activities, and protect repaired construction. Cleaning, repair and protection of testing areas is the Contractor's responsibility, regardless of the assignment of responsibility for testing, inspection or other quality control or assurance services.

END OF SECTION 014000

# SECTION 014200 - REFERENCES

## PART 1 - GENERAL

Certain terms are defined in this section. That stated, specification language often includes terms that are defined elsewhere in the Contract Documents, including the Construction Contract Clauses. The definitions provided in this section are not necessarily complete or exclusive, but are general for the Work and may be explained more explicitly in other sections.

### 1.1 DEFINITIONS

A. Agreement: The Agreement forms part of the Contract between the parties.

B. "Building Manager" is the Government employee responsible for the administration, operation and maintenance of the building.

C. Contract: see Agreement.

D. "Cutting" refers to removal of material by cutting, sawing, drilling, breaking, chipping, grinding, excavating and similar operations.

E. "Furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembling, installation and similar operations.

F. “General Terms and Conditions" are defined by the Agreement.

G. “Government" refers to the Department of Justice.

H. "Indicated" refers to graphic representations, notes or schedules on the Drawings, or to requirements elsewhere in the Specifications or other Contract Documents. Terms such as "shown", "noted", "scheduled" and "specified" have the same meaning as "indicated" and are used to further help locate the reference, but no limitation on location is intended.

I. "Install" describes operations at the Project site, including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

J. "Installer", unless otherwise noted or under separate contract with the Government, is the Contractor or another entity engaged by the Contractor, either directly or indirectly through subcontracting, to perform a particular construction operation at the Project site, including installation, erection, application and similar operations. Installers shall be skilled in the operations they perform. Where indicated, installers shall also be Specialists as defined in the Construction Contract Clauses.

K. "Label": This must be provided by a National Recognized Testing Laboratory (NRTL), or other entity approved by the CO. The burden of documentation for validation shall be provided by the Contractor.

L. "Notice to Proceed" is the Contracting Officer's notification by letter to the Contractor to proceed with the Contract. Issuance of the Notice to Proceed may activate the time period for the completion of certain work, including Substantial Completion and Contract Completion.

M. “Owner" is the Government.

N. "Patching" refers to restoration of a surface to its original completed condition by filling, repairing, refinishing, closing and similar operations.

O. "Project site" refers to the space available to the Contractor for performance of the Work, either exclusively or in conjunction with others performing other work.

P. "Provide" means to furnish and install, complete in place and ready for full use.

Q. "Punch List" is the entire listing of all incomplete and/or defective work including items that must be completed pursuant to Contract Completion.

R. “Regulations" are found in the FAR and CFR including orders issued by the government.

S. “Substantial Completion" is defined in the Agreement.

T. “Superintendent” refers to the Contractor’s on site representative who is responsible for continuous field supervision, coordination, planning, scheduling, and completion of the work and, unless another person is designated by the contract specification as the safety officer, jobsite safety.

U. "Testing Agency" or "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report the results of those inspections and tests.

V. Where "directed", "authorized", "selected", "approved", or a similar term is used in conjunction with the Contractor's submittals, applications, requests and other activities, and the specifications state that an individual other than the Contracting Officer, such as the Contracting Officer's Representative (COR), shall provide this action, it is understood that only the Contracting Officer has this authority unless the Contracting Officer provides written authorization to a different individual. The Contracting Officer shall provide the written authorization to the Contractor, upon request.

## 1.2 DRAWING SYMBOLS

A. Except as otherwise indicated, symbols used on the Drawings are those symbols recognized in the construction industry.

1. These include graphic symbols defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., as well as graphic symbols recommended by ASHRAE, ASME, ASPE, CSI, IEEE and similar technical organizations for the mechanical and electrical Drawings.
2. The Contractor shall refer uncertainty or ambiguity as to meaning of symbols to the Contracting Officer for clarification before proceeding.

## 1.3 INDUSTRY STANDARDS

A. Applicability of Standards: The Contract Documents require the Contractor to meet, satisfy, or otherwise follow various industry standards. Unless otherwise stated in the Contract Documents, the industry standards are incorporated into the Contract Documents by reference .

B. Publication Date. The publication date for any industry standard is the most recent version as of the date that the Government issues the Solicitation.

C. Abbreviations and Acronyms used in the Specifications and other Contract Documents mean the recognized name of a trade association, standards-producing organization, and authority having jurisdiction or other entity applicable to the context of the particular provision. Except as otherwise indicated, refer to the current editions of the following publications for abbreviations:

1. "Encyclopedia of Associations: National Organizations of the U.S.", published by Gale Research.
2. "National Trade and Professional Associations of the United States", published by Columbia Books.
3. "Means Illustrated Construction Dictionary - New Unabridged Edition" published by R.S. Means Company, Inc.
4.

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION (Not Applicable)

END OF SECTION 014200

# SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This section includes requirements for temporary utilities, support facilities and protection.

1. Temporary utilities include but are not limited to the following:

   a. Temporary water service and distribution.
   b. Temporary electric power and lighting.
   c. Temporary cooling and ventilation.
   d. Temporary telephone service.
   e. Temporary sanitary facilities, including drinking water.

2. Support facilities include but are not limited to the following:

   a. Temporary enclosures, roofs and other building envelopes.
   b. Temporary lifts and hoists.
   c. Project identification and other temporary signs.
   d. Waste disposal services.
   e. Other construction aids and miscellaneous services and facilities.

3. Protection includes but is not limited to the following:

   a. Temporary fire protection.
   b. Barricades, warning signs, and lights.
   c. Environmental protection.
   d. Covering of outside air intakes.

B. Provide temporary facilities and controls required for construction activities except for facilities and controls indicated as existing or provided by the Government or others.

### 1.2 UTILITY USE CHARGES

A. Unless otherwise specified, Contractor shall pay utility service use charges for temporary utilities used by all entities engaged in construction activities at the Project site. Costs for these services are included in the Contract price.

B. Water Service: The Contractor may use water from the Owner's existing water system, without metering and without payment of use charges.

C. Electric Power Service: Contractor may use electric power from the Owner's existing electric power system, without metering and without payment of use charges.

### 1.3 ACTION SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

## 1.4 QUALITY ASSURANCE

A. Standards and Regulations: In temporary facilities, comply with industry standards, applicable laws, and regulations of authorities having jurisdiction, including but not limited to the following:

1. Building code requirements.
2. Health and Safety regulations.
3. Police, fire department, local fire marshal and rescue squad rules.
4. Environmental protection regulations.
5. For temporary egress, ABAAS regulations.
6. NFPA 241 "Standards for Safeguarding Construction, Alterations and Demolition Operations".
7. ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition".
8. NECA Electrical Design Library "Temporary Electrical Facilities", NFPA 70,

## 1.5 PROJECT CONDITIONS

A. Install, operate, maintain and protect temporary facilities and controls.

1. Keep temporary facilities clean and neat in appearance.
2. Operate temporary facilities in a safe and efficient manner.
3. Relocate temporary facilities if needed as Work progresses.
4. Do not overload temporary services and facilities or permit them to interfere with progress.
5. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances on-site.

B. Temporary Use of Permanent Facilities and Services: Contractor shall assume responsibility for the operation, maintenance and protection of the facility and each permanent service during its use as a construction facility prior to the Government's acceptance.

C. Existing Equipment and Items: Cover or otherwise protect and provide security for existing equipment and other items that are to remain in place, to prevent soiling, damage and loss, the cost of which is the responsibility of the Contractor.

1. Temporarily move equipment and other items that interfere with the performance of required work.

2. Store equipment and other items that have been temporarily removed. Upon reinstallation, clean and, if damaged, repair or replace equipment and items to match their condition prior to removal.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Provide undamaged materials in serviceable conditions and suitable for use intended.

B. Tarpaulins: Waterproof, fire-resistant UL labeled with flame spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene fire-retardant tarpaulins.

C. Water: Shall be potable and approved by local health authorities.

D. Wood: Lumber complying with DOC PS 20 and applicable grading rules of an inspection agency certified by ALSC's Board of Review for specific use.

E. Sign, Directory and Other Graphic Panel Materials: Unless otherwise indicated, products shall be as follows:

1. Panels: Exterior type Grade B-B high density concrete-form-overlay plywood.
2. Paint: Exterior primer and exterior grade alkyd gloss enamel top coat.

F. Safety Barrier and Covered Walkway Materials: Unless otherwise indicated, products shall be as follows.

1. Panels: Minimum 5/8 inch (16 mm) thick exterior plywood.
2. Paint: Exterior primer and exterior grade acrylic-latex emulsion top coat.

G. Dust control:

1. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 914 by 1624 mm (36 by 60 inches).
2. Polyethylene Sheet: Reinforced, fire-resistive sheet, 0.25 mm (10 mils) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test 2.

### 2.2 EQUIPMENT

A. Provide equipment in serviceable condition and suitable for use intended.

1. Water Hoses: 3/4" (19 mm) heavy duty abrasive-resistant flexible rubber hoses, 100 feet (30 m) long with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge
2. Electric Outlets: NEMA-polarized outlets to prevent insertion of 110 to 120 Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground fault circuit interrupters, reset button and pilot light for connection of power tools and equipment.

3. Electric Power Cords: Grounded extension cords.

    a. Provide hard-service cords where exposed to abrasion or traffic.
    b. Provide waterproof connectors to connect separate lengths of electric cords where single lengths will not reach areas of construction activity.
    c. Do not exceed safe length-voltage ratio.

4. Lamps and Light Fixtures: General service lamps of wattage required for adequate illumination.

    a. Provide guard cages or tempered glass enclosures where exposed to breakage.
    b. Provide exterior fixtures when exposed to moisture.

5. Cooling Units: Temporary cooling units that have been tested and labeled by UL, FM or another recognized trade association related to the type of operation consumed.

6. Self-Contained Toilet Units: Temporary single-occupant toilet units of the chemical, aerated recirculation, or combustion type for use by construction personnel. Units shall be vented and enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

7. Fire Extinguishers: Hand-carried portable UL-rated fire extinguishers.

    a. Class A extinguishers for temporary offices and similar spaces.
    b. Class ABC dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for exposures in other locations.
    c. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent and size required by location and class of fire exposure.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities.

B. Locate facilities where they will serve the project with minimum interference to performance of construction activities. Maintain, relocate and modify facilities as required for the duration of the performance of the Work.

### 3.2 TEMPORARY UTILITIES

A. Coordinate interruptions and outages with the Building Manager and any affected stakeholders, provide adequate utility capacities, and obtain easements if necessary.

1. Cooling and Ventilation: Provide temporary cooling and ventilation required for the continued building operation and protecting occupants and building systems from adverse effects of high temperatures and high humidity. Use safe equipment that will not have a harmful effect on elements being installed and on completed installations. Coordinate

ventilation requirements to produce the ambient condition required for the work and to minimize energy consumption, and to protect personnel from harmful effects.

B. Telephone: Provide a cellular phone for the Contractor's Superintendent's use. Distribute cellular phone number to Contracting Officer's Representative during the pre-construction meeting. Contractor's and subcontractor's personnel are not permitted to use existing telephone system in the building

## 3.3 TEMPORARY SUPPORT FACILITIES

A. Temporary Enclosures: Provide temporary enclosures to protect the interior of the building from any risk of moisture intrusion during construction.
   1. Install tarpaulins securely with incombustible framing. Close openings of 25 sq. ft. (2.3 sq. m.) or less with plywood or similar materials.
   2. Close openings through floor or roof decks and other horizontal surfaces with load-bearing wood-framed construction.
   3. Where enclosure exceeds 100 sq. ft. (9.2 sq. m) in plan area, use UL labeled fire-retardant-treated wood and plywood for framing and sheathing.

B. Temporary Cranes, Lifts and Hoists: Provide protection of facilities, personnel and landscaping for hoisting materials.

C. Existing Elevator Use: Use of existing freight or passenger elevators will be not be permitted.

D. Locate sanitary facilities and other temporary construction and support facilities for easy access.

E. Collection and Disposal of Waste/Salvaged Material: Collect waste from construction areas and elsewhere daily. Collect salvaged/recycled material from construction areas and elsewhere as necessary. Enforce requirements strictly and dispose of material lawfully.

   1. Comply with NFPA 241 for removal of combustible waste material and debris.
   2. Do not hold waste materials more than 7 days during periods when the ambient temperature remains continuously less than 80□F (27□C), or more than 3 days when the temperature exceeds or is expected to rise above 80□ (27□C).
   3. Handle and properly containerize hazardous, dangerous or unsanitary waste materials separately from other waste.
   4. Comply with Section 017419 Construction Waste Management and Disposal.

## 3.4 TEMPORARY PROTECTION FACILITIES

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, stormwater, sanitary, waterway, and subsoil contamination or pollution or other undesirable effects. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons near the site. When working in or near existing facilities, provide dustproof enclosures for protection where dirty work is performed. Dampen debris when removed to avoid dusting.

1. Comply with work restrictions specified in Division 01 Section "Summary."

B. Temporary Fire Protection: Install and maintain temporary fire protection measures and devices of types needed to protect against reasonably predictable and controlled fire losses.

1. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations".
2. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher at or near each access route exit or entrance, including stairwells on each floor.
3. Store combustible materials in containers in fire-safe locations.
4. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities and access routes. Prohibit smoking in hazardous fire-exposure areas.
5. Provide supervision of welding operations, combustion-type temporary heating units and other sources of fire ignition.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, as indicated in accordance with authorities having jurisdiction.

D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard involved. Where appropriate and needed, provide lighting, including flashing red or amber lights.

E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

F. Weather Protection: Provide protection for work areas affected by moisture and thermal change, including building floor areas, masonry scaffolds and fabrication areas. Covering, enclose and heat to maintain a relatively dry work area with a minimum temperature of 40 F at the working surface.

## 3.5 MOISTURE CONTROL

A. Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction. Remove and replace any materials contaminated by mold in accordance with applicable environmental procedures by EPA, OSHA or any other regulating authorities. The contractor shall plan to minimize water intrusion during the project and shall respond quickly to mitigate the effects of any water intrusion that does occur.

## 3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis to avoid possibility of damage.
2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect underground lines from damage during excavation operations.

C. Termination and Removal: Each temporary facility shall be removed not later than at Substantial Completion when the need for its service has ended and can be replaced by use of a permanent facility. Complete, restore, and replace permanent construction that may have been delayed and damaged because of interference with the temporary facility.

1. Materials and facilities that constitute temporary facilities are the property of the Contractor, except the Government reserves the right to take possession of project identification signs.
2. Prior to project completion, replace, clean, and restore permanent facilities used during the construction period.

END OF SECTION 015000

# SECTION 015930 - SECURITY REGULATIONS

## PART 1 - GENERAL

### 1.1 GENERAL SECURITY REGULATIONS

A. Agency Security Regulations: All persons employed within the boundaries of the restricted-access areas therein, and all persons permitted to enter such property and areas shall comply with the security regulations that have been established for this Contract.

1. The Contractor agrees on behalf of themselves and all subcontractors that the following security regulations will be observed by Contractor and subcontractor personnel on the property. The Contractor shall make it a specific provision of his subcontracts that these regulations be accepted.
2. At the commencement of the work under this Contract, the following security facilities and procedures will apply for classified areas within the facility:

    a. The Contractor shall provide information about all Contractor and subcontractor personnel and others who require continuing access to the site, before access is required and when access ceases.
    b. Within 30 calendar days after the award of the Contract, the Contractor shall submit a list on the Contractor's letterhead stationary of all employees, subcontractors and their employees, and others who will perform work or otherwise require access to the classified area. Personnel shall be listed in alphabetical order by company. The list shall include their full name and address.
    c. The Contractor shall notify the Government in writing when personnel are no longer employed by the Contractor or a subcontractor that have been cleared.
    d. In order to permit the Government to supply credentials, they shall follow the procedures for obtaining a credential as outlined in the Construction Contract Agreement section of the solicitation.

3. At the commencement of the work under this contract, the following security procedures shall apply to the Contractor and all subcontractors.

    a. Comply with the security regulations of the building.
    b. Cameras are not permitted without written permission from the Contracting Officer or his designated representative. If approved, permission will be granted in writing and will provide additional guidelines.
    c. Personnel may be subject to inspection of their personal effects when entering and leaving the facility. In addition, unscheduled inspections of personnel may be made while on site.
    d. In any work scheduled within the classified area is canceled, notify the Contracting Officer or his designated representative.

4. The CO reserves the right to close down the job site and order Contractor personnel off the premises in the event of a national emergency or a shut-down, for as long as security problems persist. The Contractor may only return to the site with verbal approval from the CO his authorized representative.

5. The Government reserves the right to exclude or remove from the site or building any employee of the Contractor or a subcontractor whom the Government deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the work is deemed by the Government to be contrary to the public interests. The Government further reserves the right to complete processing of the security documentation for personnel assigned to work within classified areas prior to access to such areas by the personnel.
6. For overtime work within the classified area, the Contractor shall give the Contracting Officer or his designated representative at least 5 calendar day's notice. This notice is required so that security escorts may be provided and is separate and distinct from any notices required for utility shutdown or other outages. Also, the Contractor shall notify the Government if personnel will not report to the job site on a particular day so that the security escort can be released for other duties.
7. A detailed weekly schedule shall be submitted once a week by the close of business on the last day of the previous week's work for work planned within classified areas.. The schedule shall include the following:

    a. Specific location of work for each trade.
    b. Description of work for each trade.
    c. Number of persons who will be on site for each location and trade.
    d. Specific impacts required, such as equipment or utility shutdowns.
    e. Hours of operation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 015930

# SECTION 015950 - SAFETY AND HEALTH

## PART 1 - GENERAL

### 1.1 SUMMARY

A. References: In addition to publications referenced in the Construction Contract Clauses, the following Code of Federal Regulations (CFR) and publications apply to conduct of the work. State and local safety and health regulations that apply are not cited herein. Current editions at the date of the agreement apply. The more stringent requirements apply.

1. 29 CFR, Part 1910: Occupational Safety and Health Administration (OSHA) General Industry and Health Standards.
2. 29 CFR, Part 1926 " Safety and Health Regulations for Construction"
3. 40 CFR 260, "Hazardous Waste Management System"
4. 40 CFR 261, "Identification and Listing of Hazardous Waste."
5. 40 CFR, Part 761, EPA Polychlorinated Biphenyls (PCBs), Manufacturing, Processing, Distribution in Commerce and Use Prohibitions.
6. National Fire Protection Association (NFPA) 70E Electrical Safety Requirements for Workplace Safety
7. U.S. Army Corps of Engineers (USCOE) Safety and Health Requirements Manual, EM 385-1-1, current edition.
8. Federal Standard: Fed. Std. 313A, Material Safety Data Sheets, Preparation and the Submission of.
9. .

B. Acquisition of Publications:

1. Codes of Federal Regulations (CFR) and the U.S. Army Corps of Engineers EM 385-1-1 may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
2. NFPA publications may be purchased from the National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

### 1.2 SAFETY MEETING

A. Prior to commencing construction, representatives of the Contractor, including the principal on-site project representative and one or more safety representatives, shall meet with designated representatives of the government for the purpose of reviewing the Contract's safety and health requirements. The safety and health program shall be reviewed, and specific implementation of safety and health provisions pertinent to the Work shall be discussed.

B. Safety Meetings shall be as directed by the COR. Contractor shall prepare meeting minutes for each meeting. Contractor’s project manager, safety officer, project superintendent and any other supervisors shall be required to attend these meetings with the Government and its designated on-site representatives.

## 1.3 SAFETY AND HEALTH PROGRAM

A. Contractor Responsibility: The Contractor shall assume full responsibility and liability for compliance with applicable codes, standards and regulations pertaining to the health and safety of personnel during execution of the Work, and shall hold the Government harmless for any action on the Contractor's part, or that of the Contractor's employees or subcontractors, that results in illness, injury or death.

B. Site Safety and Health Officer: A trained and experienced individual shall be delegated in writing as the Site Safety and Health Officer (SSHO). The SSHO shall be responsible for the development, implementation, oversight and enforcement of the Contractor's Accident Prevention Plan (APP) on-site, which shall address all activities for which the Contractor is responsible. The Contractor may appoint as many individuals as he or she deems appropriate to accomplish the provisions of this section. The SSHO shall typically remain on-site full time during activities conducted under this contract. The SSHO may be an individual with other responsibilities, already identified to be on site and who has the authority and appropriate knowledge to oversee and act on the provisions of this section.

C. First Aid and Emergency Response Requirements: The Contractor shall provide for emergency first aid equipment. Additionally, a 20-pound ABC-rated fire extinguisher shall be maintained on-site as well as absorbent material of sufficient quantity to collect any spill which might occur during this project. A listing of emergency phone numbers and points of contact for fire, hospital, police, ambulance, and other necessary contacts shall be posted at the Contractor's site.

D. Contractor shall provide for site visitors Personal Protective Equipment (PPE) per OSHA for use during their visits. Provide a minimum of 10 sets with replacements for items not suitable for re-use.

## 1.4 INFORMATIONAL SUBMITTALS

A. Submit a copy of the project safety and health programs, as applicable to the work scope or required as a result of the safety meeting.

1. Occupational Noise Exposure.
2. Fall Protection.
3. Personnel Protective Equipment.
4. Falling Object Protection.
5. Crane, Derrick and Hoist Safety.
6. Control of Hazardous Energy.
7. Electrical Safety Related Work Practices.
8. Lead.
9. Asbestos.
10. Respirator Protection.

B. Contractor's Safety Plan: In addition to specific safety and health programs applicable to the project, Contractor shall submit firm's general safety plan at the pre-construction conference listing emergency procedures and contact persons with home addresses and telephone numbers.

C. Permits: If hazardous materials are disposed of off-site, submit copies of shipping manifests and permits from applicable federal, state or local authorities and disposal facilities, and submit certificates that the material has been disposed of in accordance with regulations. Contractor shall be responsible for obtaining the Environmental Protection Agency's (EPA) Hazardous Waste Generator ID Number for disposal of contractor generated hazardous waste; submit within 10 days of receiving Generator ID Number from the EPA.

D. Accident Prevention Plan (APP): Submit an electronic copy of the APP .

E. Accident Reporting: Submit an electronic copy of each accident report that the Contractor or Subcontractors submits to their insurance carriers, within seven calendar days after the date of the accident.

F. Emergency call down tree: Include an emergency call down tree containing contact info for all team members as part of the Contractor Safety Plan.

G. If the contractor brings hazardous materials onto the property, the contractor shall submit a hazardous material management plan which shall, at a minimum, identify and provide the Material Safety Data Sheet (MSDS) for each material, describe proper handling and storage procedures for each material, and describe the contractor's plan for responding to a spill or release of the material(s).

## PART 2 - PRODUCTS

### 2.1 PERSONNEL PROTECTIVE EQUIPMENT

A. Special facilities, devices, equipment and similar items used by the Contractor in execution of the Work shall comply with the applicable regulations.

## PART 3 - EXECUTION

### 3.1 HAZARDOUS MATERIALS AND CONDITIONS

A. The Contractor shall advise the CO of any additional hazardous material and/or hazardous condition encountered during execution of the work that is not identified in the contract documents. The CO shall determine if the Contractor must perform additional tests and if the work for the particular material or condition shall cease. Work shall recommence at the direction of the CO. The SSHO shall take measures to protect personnel until the CO has rendered its decision.

### 3.2 EMERGENCY SUSPENSION OF WORK

A. When the Contractor is notified of non-compliance with the safety or health provisions of the Contract, the Contractor shall immediately cease work in the subject area unless otherwise instructed, and correct the unsafe or unhealthy condition.

1. If the Contractor fails to comply promptly, all or part of the Work will be stopped by notice from the CO.
2. When the CO determines that satisfactory corrective action has been taken by the Contractor, work shall resume.
3. The Contractor shall not be allowed any extension of time or compensation for damages in connection with a work stoppage for an unsafe or unhealthy condition.

## 3.3 PROTECTION OF PERSONNEL

A. The Contract shall take necessary precautions to prevent injury to the public, occupants, and work forces. The public and occupants includes all persons not employed by the Contractor or a subcontractor.

B. The work area shall be fenced, barricaded or otherwise blocked off from the public or occupants to prevent unauthorized entry into the work area. Control by authorized personnel shall be done where passage through is necessary for the work.

1. Provide traffic barricades and traffic control signage where construction activities occur in vehicular areas.
2. Corridors, aisles, stairways, doors and exit ways shall not be obstructed or used in a manner to encroach upon routes of ingress or egress utilized by the public or occupants, or to present an unsafe or unhealthy condition to the public or occupants.
3. Store, position and use equipment, tools, materials, in a manner that does not present a hazard to the public or occupants
4. Store and transport refuse and debris in a manner to prevent unsafe and unhealthy conditions for the public and occupants. Cover refuse containers, and remove refuse on a frequent regular basis. Use tarpaulins or other means to prevent loose transported materials from dropping from trucks.

## 3.4 ENVIRONMENTAL PROTECTION

A. Dispose of solid, liquid and gaseous contaminants in accordance with applicable federal, state, and local codes, laws, ordinances and regulations.

B. Comply with applicable federal, state and local noise control laws, ordinances and regulations, including but not limited to 29 CFR 1910.95 and 29 CFR 1926.52.

END OF SECTION 015950

# SECTION 016000 – PRODUCT REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project, including manufacturers' standard warranties on products and special warranties.

B. The following definitions are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms that are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" means items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and other terms of similar intent.
2. "Materials" means products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" means products with operational parts, whether motorized or manually operated, and products that require service connections, such as wiring or piping.

C. Warranties: Standard, and special warranties required by the individual sections of the Specifications shall provide guarantees in terms of time limits or rights of the Government in addition to those contained in the Construction Contract Clauses.

1. Standard product warranties shall be preprinted written warranties published by individual manufacturers for particular products, and shall be specifically endorsed to the Government by the manufacturer.
2. Special warranties shall be specifically written to incorporate particular requirements of the Contract Documents, and shall be endorsed to the Government by the entities responsible for the work, as stated in the individual section.

## PART 2 - SUBMITTALS

A. Submittals: See section 013300 Submittals

### 2.2 QUALITY CONTROL

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source. Equipment of the same function shall be manufactured by the same entity, unless otherwise indicated.

B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected.

C. Labels and nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous. Labels indicating compliance with recognized organizations require confirmation by submitted documents.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate nameplate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information:

   a. Name of product manufacturer.
   b. Model and serial numbers.
   c. Operating data such as capacity, speed and ratings.
   d. Name and phone number of Installer.

3. Protection: Labels and nameplates shall be protected from defacement and other damage during the remainder of the Work.

## 2.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.

1. Schedule product delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to provide minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
3. Deliver products to the site in an undamaged condition, in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weather-tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

# PART 3 - PRODUCTS

## 3.1 PRODUCT COMPLIANCE AND REQUIREMENTS

A. Provide products complete with accessories, trim, finish, safety guards, devices and other items needed for a complete installation and the intended use and effect. Where specified and available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: The Contract Documents, including the Construction Contract Clauses, govern product selection. Requirements for product selection include the following:

1. Where the Specifications lists manufacturers' names or product designations, the Contractor may provide any product that complies with the requirements, subject to the following conditions:

    a. Available Manufacturers: Where a Specification paragraph or subparagraph titled "Available Manufacturers" lists a minimum of three manufacturers' names, provide a compliant product by one of the manufacturers named or by another manufacturer.
    b. Available Products: Where a Specification paragraph or subparagraph titled "Available Products" lists minimum of three product designations, provide one of the products designated or another compliant product.
    c. Basis of Design: Where a Specification paragraph or subparagraph titled "Basis of Design" includes a product designation, provide the product designated, or request a Substitution of a compliant product by a named or other manufacturer.

2. Descriptive Requirements: Where Specifications describe a product or assembly, listing the characteristics required, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
3. Performance Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.
4. Prescriptive Requirements: Where Specifications require products that are produced using specified ingredients and components, including specific requirements for mixing, fabricating, curing, finishing, testing and similar operations in the manufacturing process, provide products produced in accordance with the prescriptive requirements that otherwise comply with Contract requirements.
5. Codes, Standards and Regulations: Where Specifications require compliance with an imposed code, standard or regulation, select a product that complies with these requirements.
6. Visual Matching: Where Specifications require matching an established Sample, the Government's decision will be final on whether a proposed product matches satisfactorily. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions concerning "substitutions" for selections of a matching product in another product category.
7. Visual Selection: Where specified product requirements include the phrase "as selected from manufacturer's standard colors, patterns, textures" or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Government will select the color, pattern and texture from the manufacturer's product line.

C. The Contractor's submittal and the Government's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

## 3.2 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work.

D. Rejection of Warranties: The Government reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment for the Work or part of the Work, the Government reserves the right to refuse to accept the Work until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

# PART 4 - EXECUTION (Not Applicable)

END OF SECTION 016000

# SECTION 017000 – EXECUTION REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This section includes certain general procedural requirements governing the Contractor's execution of the Work, including, but not limited to laying out the work, general installation of products, correction of defective work, and cleaning.

B. Substitutions: Changes in methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract shall comply with the procedures and conditions specified for Substitutions in the Construction Contract.

### 1.2 SUBMITTALS

A. Field Correction Requests: Immediately upon discovery of the need to deviate from requirements of the Contract Documents, submit a field correction request for review. Include a detailed description of the problem encountered, together with recommended changes and detailing the reasons for deviating from the Contract Documents.

B. Manufacturer's Field Services Submissions: Where product manufacturers are required by the individual sections of the Specifications to provide qualified personnel to observe conditions of project conditions, installation or workmanship, start up or adjustment of equipment, tests or other activities, and to initiate instructions when necessary, the following shall be submitted to the CO:

1. Qualifications: For approval, submit qualifications of observer at least 30 calendar days in advance of scheduled activities.
2. Report: For information, submit report of activities and findings within 15 calendar days after the successful execution of the specified work. Include logs and other documented data where applicable.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous and other waste disposal. Also submit copies of receipts for any items recycled or salvaged.

### 1.3 QUALITY CONTROL

A. Workmanship Standards: Initiate and maintain procedures to ensure personnel performing the work are skilled and knowledgeable in the methods and craftsmanship needed to produce the required levels of workmanship. Remove and replace work that does not comply with workmanship specified and standards recognized in the construction industry for the applications indicated. Remove and replace work damaged or deteriorated by faulty workmanship or replacement of other work.

1. Manufacturer's Instructions: Where installations include manufactured products, comply with manufacturer's applicable installation instructions and recommendations to the

extent that those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.

2. Specialists: Where the individual sections of the specifications require specialists to perform the work, comply with the requirements specified in the Construction Contract Clauses. The assignment of a specialist shall not relieve the Contractor from complying with applicable regulations, union jurisdictional settlements or similar conventions, and the final responsibility for fulfillment of the entire requirements remains with the Contractor.
3. Minimum Quality and Quantity: The quality level or quantity shown or specified shall be the minimum required for the work. Except as otherwise indicated, the actual work shall comply exactly with that minimum or may be superior to that minimum within limits acceptable to the CO. Specified numeric values are either minimums or maximums as indicated or as appropriate for the context of the requirements.
4. Availability of Tradespersons and Manufacturer's Field Services Representatives: At each progress or coordination meeting, review availability of tradespersons, qualified manufacturers' representatives required in the specifications, and projected needs to accomplish work as scheduled. Require each entity employing personnel to report on events which might affect progress of work. Where possible, consider alternatives and take actions to avoid disputes and delays

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine applicable substrates and conditions under which the Work will be performed before starting construction operations.

B. If unsafe or otherwise unsatisfactory conditions are encountered take corrective action before proceeding. Provide a written report documenting the conditions with the corrective actions taken.

3.2 PREPARATION

A. Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Confirm dimensional requirements of the contract documents can be met.

B. Verify space requirements of items shown diagrammatically on Drawings.

3.3 INSTALLATION

A. Locate the Work and components of the Work accurately.

1. Make vertical work plumb and horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and to maximize ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless construction documents have designated otherwise.

B. Install products at the time and under conditions that will produce satisfactory results.

1. Maintain temperature, humidity and other weather controls for best performance.
2. Isolate units of non-compatible work to prevent deterioration.

C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

D. Conduct construction operations so that no part of the Work is subjected to damaging operations, or loading in excess of that structurally designed for the occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful or unacceptable levels of noise.

F. Odors and Fumes: To the greatest extent practicable, do not use products that produce harmful or noticeable odors or fumes. If necessary to use such products, coordinate ventilation requirements to produce the ambient condition required for the work and to minimize energy consumption, and to protect personnel from fumes and other harmful effects.

G. Anchors and Fasteners: Provide anchors and fasteners that will withstand stresses, vibration and physical distortion. Anchor each component securely in place, accurately located and aligned with other Work.

H. Joints: Make like joints of uniform width within contiguous surfaces. Where joint locations in exposed work are not indicated, arrange joints for a uniform and balanced visual effect.

I. Adjust operating components for proper operation

## 3.4 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

## 3.5 CORRECTION OF INSTALLED DEFECTIVE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

B. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and proper adjustment of operating equipment.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if the surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired to operate properly.

F. Remove and replace chipped, scratched or broken surfaces.

## 3.6 CLEANING

A. Maintain the project work areas free of waste material and debris. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

B. Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the work, broom- or vacuum-clean the entire work area.
3. Separate containers of hazardous materials from other waste, and mark containers to identify. Legally dispose of all waste in timely fashion.

C. Keep installed work clean. Clean installed surfaces in accordance with the recommendations of the manufacturer or fabricator of the product installed, using only the cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and will not damage exposed surfaces.

D. Remove debris from concealed spaces prior to enclosing.

E. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at the time of project completion.

## 3.7 PROTECTION

A. Protect installed work from soiling and damage.

B. Protective Coverings: Provide appropriate protective coverings for work that might be damaged by subsequent operations. Maintain protective coverings in place until project completion.

END OF SECTION 017000

# SECTION 017310 – CUTTING AND PATCHING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This section includes procedural requirements for cutting and patching in existing work.
   1. Steel.
   2. Concrete.
   3. Roofing system.

B. Definition: Cutting and patching includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and repair required to restore surfaces to their original condition. Drilling holes for fasteners and similar operations are not "cutting and patching".

C. Refer to other sections for other requirements and limitations applicable to cutting and patching individual parts of the Work.

D. Coordinate cutting and patching with demolition requirements as specified in section 024119 “Selective Demolition”.

### 1.2 SUBMITTALS

A. Cutting and Patching Plan: In accordance with section 013300, submit a detailed plan describing cutting and patching procedures at least 14 calendar days in advance of the time cutting and patching will initially be performed.

   1. Include the following information, as applicable:

      a. Description of the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
      b. Description of the anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in appearance and other significant visual elements.
      c. List of products to be used and entities that will perform work.
      d. Dates and hours of operation when cutting and patching will be performed.
      e. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that will be out-of-service temporarily. Indicate how long utility service will be disrupted.
      f. Compatibility and cohesion characteristics of patching compounds with adjacent materials.
      g. Details and engineering calculations showing integration of reinforcement with the original structure, where cutting and patching involve adding reinforcement to structural elements.
      h. Temporary protection of existing structures, surfaces, finishes, equipment, etc. to remain in place during construction.

B. Approval to proceed with cutting and patching does not waive the right to later require complete removal and replacement of unsatisfactory work.

1.3 QUALITY CONTROL

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. The cutting and patching plan shall include but not be necessarily be limited to work required at the following structural elements:

a. Masonry walls.
b. Structural concrete.
c. Structural steel.
d. Miscellaneous structural metals.

B. Operational Limitations: Do not cut and patch operating elements, safety related systems, or related components in a manner that would result in reducing their capacity to perform as intended, or that would result in increased maintenance or decreased operational life or safety.

1. The cutting and patching plan shall include but not be limited to work required on the following operating elements or safety related systems:

a. Primary operational systems and equipment.
b. Water, moisture, or vapor barriers.
c. Roofing membranes and flashings.
d. Fire protection systems.
e. Control systems.
f. Communication systems.
g. Conveying systems.
h. Electrical wiring systems.
i. Internet, data and telephone lines.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction that is cut and patched in a visually unsatisfactorily manner.

1. If it is not possible to engage the original installer or fabricator, engage a Specialist who is specifically experienced in the work.

1.4 EXISTING WARRANTIES

A. Replace, patch, and repair material and surfaces such as roofing systems, that are cut or damaged by methods and with materials in such a manner as not to void the existing warranties.

PART 2 - PRODUCTS

## 2.1 MATERIALS

A. Use materials identical to existing materials to the maximum extent available.

B. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

C. Use materials whose installed performance will equal or surpass that of existing materials.

# PART 3 - EXECUTION

## 3.1 INSPECTION

A. Before cutting, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

B. Before proceeding with cutting and patching involving two or more trades, meet at the Project site with the entities providing or affected by the cutting and patching. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 3.2 PREPARATION

A. Provide temporary support of work to be cut.

B. Protect existing conditions during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Bypass in-service existing pipe, conduit, or ductwork scheduled to be removed or relocated before cutting.

## 3.3 PERFORMANCE

A. Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Any adverse noise or odor producing work must be performed in accordance with Section 011400 Work Restrictions.
   1. Cutting: Cut existing construction using methods least likely to damage elements retained and adjoining construction. Where possible, review proposed procedures with the original installer and comply with the original installer's recommendations.
      In general, use hand or small power tools designed for sawing or grinding, not for hammering and chopping.
   2. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

3. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Cut through concrete and masonry using silicon carbide or harder tipped tools.

B. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

a. Inspect and test patched areas to demonstrate integrity of the installation.
b. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will eliminate evidence of patching and refinishing.
c. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface that contains the patch.

## 3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove all evidence of the Work.

B. Thoroughly clean piping, conduit, and similar features before applying paint, restored pipe coverings, or other finishing materials.

END OF SECTION 017310

# SECTION 017419 – CONSTRUCTION NONHAZARDOUS WASTE MANAGEMENT AND DISPOSAL

## 1.1 GENERAL

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

## 1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Disposing of nonhazardous demolition and construction waste.

## 1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

## 1.4 PERFORMANCE REQUIREMENTS

A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

## 1.5 INFORMATIONAL SUBMITTALS

A. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 IMPLEMENTATION

A. General: Provide handling, containers, storage, signage, transportation, and other items as required to manage waste during the entire duration of the Contract.

B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from the Government's property and legally dispose of them.

END OF SECTION 017419

# SECTION 017700 – CLOSEOUT PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. See the Agreement for Definition of Substantial Completion.

B. This Section includes administrative and procedural requirements for Contract closeout including, but not limited to, the following:

1. Substantial Completion procedures.
2. Project record document submittal. Coordinate with section 017823 Operation & Maintenance Data.
3. Final cleaning
4. Repair of the Work.

C. Closeout requirements for specific construction activities are included in the individual sections in Divisions 2 through 49.

### 1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for Substantial Completion, complete the following.

1. Provide supporting documentation for completion as indicated elsewhere in the Contract Documents.
2. Submit a list to the Government, of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
3. Obtain and submit releases enabling the Government unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
4. Warranties and guarantees shall not begin until substantial completion. Warranties and guarantees for any equipment that comes on line at a later date which is accepted by the Government shall commence on that date.
5. Warranty of any systems or items being used during the occupancy period shall have been completed and submitted at the time of government's written acceptance including the date for Notice of Substantial Completion. The Authority Having Jurisdiction is the Government.
6. The punch list of non-completed work and items shall be submitted.

B. Inspection Procedures: On receipt of a request for inspection, the CO will either proceed with inspection or advise the Contractor of unfulfilled requirements. The CO will notify the Contractor of Substantial Completion following the inspection or advise the Contractor of construction that must be completed or corrected before Substantial Completion.

1. The CO will repeat the inspection when requested and when assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of the requirements for Final Acceptance.
3. Items that are not included on the punch-list will not relieve the Contractor from performing all work required and in accordance with the construction documents.

## 1.3 FINAL ACCEPTANCE FOR CONTRACT COMPLETION

A. Preliminary Procedures: Before requesting re-inspection for Final Acceptance, complete the following:

1. Submit an updated final statement, accounting for final additional changes to the Contract price.
2. Submit a certified copy of the previous Substantial Completion inspection list of items to be completed or corrected. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance, and shall be endorsed and dated by the Contractor.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents. State warranty commencement dates.
4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item.
5. Submit record documents including similar final record information.
6. Deliver tools, spare parts, extra stock and similar items.
7. Complete final clean-up requirements including touch-up painting of marred surfaces.
8. At the end of the acceptance submit final payment request with releases and supporting documentation not previously submitted and accepted.

B. Re-inspection Procedure: The CO will re-inspect the Work upon receipt of notice from the Contractor that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the CO.

1. Upon completion of re-inspection, the CO will notify the Contractor of Final Acceptance or will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled and are required for Final Acceptance.
2. If necessary, re-inspection will be repeated.

C. Contractor's Responsibility for Re-Inspection Following Substantial Completion: If the final completion or acceptance is delayed for more than thirty (30) calendar days following substantial completion through no fault of the Government, CM, or the A/E; the Contractor shall be responsible for the Government's additional costs associated with re-inspections. During this 30-day period, the CM and/or A/E will make only one (1) re-inspection to verify completion of the punch list. Any additional re-inspections, administrative services, or direct costs will be considered CM and/or A/E additional services. The Government's actual costs for CM and/or A/E additional re-inspections, administrative services, or direct costs will be charged to the Contractor through an appropriate contract modification in the form of a credit to the Government.

## 1.4 RECORD DOCUMENT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Record As-Built Drawings: Maintain both electronic media copies and a clean, undamaged set of blue or black line white-prints of all Contract Documents. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing that is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Electronic record copies showing changes shall be done clearly such that the changes are understood so that they can be constructed.

C. Record Product Data: Maintain one copy of each Product Data submittal. Note related modifications and markups of Record Drawings and Specifications.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

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

# PART 3 - EXECUTION

## 3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Government's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following:

1. Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package as individual electronic PDF files.
2. Operation and Maintenance manuals.

B. Maintenance agreements and similar continuing commitments. As part of instruction for operating equipment, demonstrate the following procedures:

1. Startup.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.

## 3.2 FINAL CLEANING

A. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial cleaning and maintenance program. Comply with manufacturer's instructions.

B. Do not use caustic or acidic cleaning materials that will mar or etch finished work.

1. Complete the following cleaning operations before requesting inspection for Final Acceptance.

C. Removal of Protection: Remove temporary protection and facilities installed for the protection of the Work during construction.

## 3.3 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition. All components of the construction including operational and material shall be in new condition and new working order at the completion of Repair of the Work.

END OF SECTION 017700

# SECTION 017823 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Systems and equipment operation manuals.
   2. Systems and equipment maintenance manuals.

B. Related Requirements:

   1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

### 1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

### 1.3 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

B. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

### 1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

B. Manuals, Paper Copy: Submit final approved manuals in the form of hard-copy, bound and labeled volumes in addition to electronic files.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf or post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
2. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
3. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 1.5 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and a separate section for each piece of equipment not part of a system.

B. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

C. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

## 1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.

9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

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

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

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

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

## 1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent,

and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 020850 - ASBESTOS ABATEMENT PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. General: This section includes work involving the removal and disposal of the identified asbestos-containing elevator brake shoes and localized cleaning of the immediate work area.

1. Work Area: The work areas is in the Elevator Machine Room in the Penthouse

2. The asbestos containing materials to be removed are three pairs of elevator brake shoes.

B. Related Work Specified in Other Sections: Section 015950, "Safety and Health," applies to all work covered by this section.

C. An inspection for asbestos-containing materials (ACM) was conducted at the UNICOR Office located at 400 1st Street Northwest in Washinton, District of Columbia. The survey was conducted in support of modernization of the elevator and limited to the areas anticipated to be disturbed. Field work was conducted on September 1, 2025. Findings of the inspection were presented in a report dated October 20, 2025 (PSI-Intertek, Project Number: 0816615-1Project Number: ###).

D. The work specified herein consists of the removal of asbestos-containing elevator brake shoes and localized cleaning of the immediate work area by personnel trained and accredited in accordance with the EPA Model Accreditation Plan (40 CFR Part 763, Subpart E, Appendix C). The Contractor shall have an EPA Asbestos Hazard Emergency Response Act (AHERA)-accredited Asbestos Supervisor present at the job site during ACM removal activities with authority to take prompt corrective measures. All work shall be performed in accordance with applicable Federal regulations governing asbestos work practices.

1.2 QUALITY ASSURANCE:

A. Contractor Qualifications: The Contractor shall be a firm of established reputation (or if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of workmen skilled in asbestos abatement, and shall have performed this work on previous projects.

1. Contractors performing asbestos abatement work shall utilize personnel trained and accredited in accordance with the EPA Model Accreditation Plan (40 CFR Part 763, Subpart E, Appendix C). An AHERA-accredited Asbestos Abatement Supervisor shall be present at the project site whenever asbestos removal activities are in progress. All workers disturbing asbestos-containing materials shall possess current AHERA Worker accreditation and shall comply with OSHA 29 CFR 1926.1101. The Contractor shall comply with all applicable federal regulations governing asbestos work practices, worker protection, and waste handling.

2. Contractors performing asbestos abatement work shall utilize personnel trained and accredited in accordance with the EPA Model Accreditation Plan (40 CFR Part 763, Subpart E, Appendix C). An AHERA-accredited Asbestos Abatement Supervisor shall be present at the project site whenever asbestos removal activities are in progress. All workers disturbing asbestos-containing materials shall possess current AHERA Worker

accreditation and shall comply with OSHA 29 CFR 1926.1101. The Contractor shall comply with all applicable federal regulations governing asbestos work practices, worker protection, and waste handling.

3. The Contractor shall provide a list of any outstanding violations received from OSHA, the EPA or any applicable Local Governing body that occurred within the last (24) months.

B. Laboratory Qualifications: If laboratory is to be utilized through the course of the abatement activities, it shall be regularly engaged in asbestos testing, and personnel used for monitoring airborne concentrations of asbestos fibers shall be proficient in this field. See "Submittals" paragraph for the specific information, which must be submitted for approval of the laboratory.

C. Asbestos Control Limits: The work area shall be designated a regulated area in accordance with OSHA 29 CFR 1926.1101. Asbestos removal shall be performed using OSHA Class II work practices appropriate for disturbance of Category II non-friable asbestos-containing materials. The Contractor shall implement worker protection measures, exposure monitoring, respiratory protection, and hygiene practices as required by OSHA. Work shall be conducted to maintain the material in a non-friable condition. Requirements of 29 CFR 1910.1001 and ASTM E 849 do not apply to this work.

Outside Regulated Area: The Contractor shall perform asbestos removal in a manner that prevents visible dust or debris from migrating outside the regulated area. The Government may observe work activities or conduct independent monitoring at its discretion. No building-wide air clearance criteria are established for this work.

1.3 REFERENCES:

A. American National Standards Institute (ANSI) Publication:

Z9.2-79 Fundamentals Governing the Design and Operation of Local Exhaust Systems

B. American Society for Testing and Materials (ASTM) Publication:

E 849-82 Safety and Health Requirements relating to Occupational Exposure to Asbestos

C. Code of Federal Regulations (CFR):

29 CFR 1910.1001, Occupational Safety and Health Act (OSHA), INCLUDING Appendix A through I.

29 CFR 1910.20, Subpart C, General Safety and Health Provisions.

29 CFR 1910.134, OSHA General Industry Respirator Requirements.

29 CFR 1926.1101. Occupational Exposure to Asbestos, Construction Industry Standard, INCLUDING Appendix A through K.

40 CFR Part 61, Subpart M: U.S. Environmental Protection Agency, National Emission Standards for Hazardous Air Pollutants (NESHAP) Asbestos.

1.4 SUBMITTALS:

A. Initial Submittals of Contractor or Subcontractor Qualification Information: Items 1.8.A.1. through 1.8.A.5 below are to be submitted after the bid receipt but are subject to review and acceptance by Contracting Officer prior to award.

1. Five Projects: Name and location of at least 5 asbestos abatement projects performed by the Contractor, including name and telephone number of contract representative.

2. Experience and Qualifications of Supervision: Name of and experience record of superintendent and foreman. Include evidence of knowledge of applicable regulations; evidence of participation and successful completion of EPA approved training course in asbestos removal and/or supervision of asbestos related work; and experience with asbestos related work in a supervisory position as evidenced through supervision of at least two asbestos abatement contracts.

3. Experience and Qualifications of Workers: Name and experience record, if any, of workmen who will be assigned to this project.

B. Post-Award Asbestos Abatement Submittals: Items 1.8.B.1. through 1.8.B.7 below are to be submitted after the award but are required to be approved by the Contracting Office or his representative prior to starting work.

1. Work Plan**:** Submit a brief work plan describing removal methods, regulated area setup, worker protection, waste packaging, and cleanup procedures.

2. Disposal Plan: A disposal plan including location of approved disposal site and the contractors' method for documenting proper asbestos disposal to the Owner or his designated representative.

3. Environmental Protection Agency (EPA) Notification: Provide a copy of the NESHAPS Notification of Demolition Renovation Form sent to the Regional EPA Asbestos Regulation Office.

C. During-Work Asbestos Abatement Submittals:

1. Work Area Information: The Contracting Officer or designated representative may observe asbestos removal activities and perform a visual inspection of the work area following completion of removal and cleanup. The Contractor shall notify the Contracting Officer when asbestos removal activities are complete and the work area is ready for inspection.

2. Transporting and Disposing of Asbestos Containing Materials (ACM):

a. Waste Shipment Records shall be submitted to the Contracting Officer within three (3) days of removal of asbestos-containing waste from the site.

b. Waste Shipment Record signed and executed by the receiving landfill shall be provided within thirty (30) calendar days.

c. Records shall include date of shipment, quantity of waste, transporter identification, and disposal facility.

D. The following documentation shall be submitted to the Contracting Officer upon completion of asbestos removal activities:

1. <u>Documentation of Waste:</u> Provide documentation of waste transported to an approved receiving facility.

2. <u>Certification of Removal:</u> Provide documentation stating that the asbestos-containing brake shoes were removed and that cleaning of work area was performed using HEPA-vacuum and/or wet wiping methods.

3. Quantification of Removed ACM: Provide documentation of quantity of asbestos containing brake shoes removed from the site.

1.5 CONTRACTOR RESPONSIBILITY:

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local regulations pertaining to the protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State, and local regulations, and shall hold the government harmless for failure to comply with any applicable safety or health regulation on the part of himself, his employees, or his subcontractors.

B. Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, all applicable codes, regulations, and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

C. The following codes and regulations govern asbestos abatement work, asbestos waste material, hauling and disposal, employee health and safety, and environmental protection:
   1. U.S. Department of labor, Occupational Safety and Health Administration (OSHA), including but not limited to:
   2. Occupation Exposure to Asbestos, Title 29, Part 1910, Section 1001 and Part 1926, Section 1101 of the Code of Federal Regulations.
   3. Respiratory Protection, Title 29, Part 1910, Section 134 of the Code of Federal Regulations.
   4. Training and Work Practices, Title 29, Part 1926, Section 26 of the Code of Federal Regulations.
   5. Employee Exposure and Medical Records, Title 29, Part 1910, Section 20 of the Code of Federal Regulations.
   6. Specifications for Accident Prevention Signage and Label, Title 29, Part 1910, Section 145 of the Code of Federal Regulations.

D. U.S. Environmental Protection (EPA):
   1. Regulations for Controlling Visible Emissions, National Emission Standard for Asbestos, Title 40, Part 61, Subpart M of the Code of Federal Regulations.
   2. Guidelines for Disposal of Solid Waste, Title 40, Part 241 of the Code of Federal Regulations.
   3. Criteria for Classification of Solid Waste Disposal Facilities and Practices, Title 40, Part 257 of the Code of Federal Regulations.

E. U.S. Department of Transportation
   1. Hazardous Material Regulations, Title 49, Part 107 of the Code of Federal Regulations.

F. The Contractor shall submit asbestos notification to the U.S. Environmental Protection Agency in accordance with 40 CFR 61 Subpart M only if notification thresholds are met. If threshold quantities are not exceeded, no notification is required. Copies of any required notification shall be provided to the Contracting Officer.

United States Environmental Protection Agency - Region III
Asbestos - NESHAP Coordinator (3AT33)
841 Chestnut Building
Philadelphia, Pennsylvania 19107

1.6 PROJECT/SITE C O N D I T I O N S :

i. Means of Egress: Establish and maintain emergency and fire exits from the work area.

ii. Use of Existing Facilities: Use of existing toilets, showers, and/or other similar facilities as decontamination areas is prohibited.

iii. Maintenance of Existing Equipment: See contract drawings for requirements.

iv. Environmental Conditions to be Maintained: Normal environmental conditions (heat, light, air conditioning) must be maintained outside of the work area.

v. Access to Work Area: Access to regulated area shall be restricted to authorized personnel:

1) Contracting Officer or Designated Representative
2) Safety & Environment Personnel
3) Contract Monitoring Personnel
4) Authorized Inspection Personnel
5) OSHA Inspectors
6) EPA Inspectors
7) Local Building or Health Officials

1.7 SEQUENCING/SCHEDULING: Asbestos abatement work will be performed after normal working hours. Any exceptions will be noted on the contract drawings.

PART 2 - PRODUCTS

2.1 EQUIPMENT:

A. Equipment, including protective clothing and respirators, used in the execution of this contract and provided to visitors to the site, shall comply with the applicable Federal, State, and local regulations. The list of required materials will include, but is not necessarily limited to the following:

1. Respiratory Protection: The Contractor shall implement a respiratory protection program and provide respiratory protection in accordance with OSHA 29 CFR 1926.1101 and 29 CFR 1910.134. Selection of respirators and exposure monitoring shall be determined by the Contractor's competent person based on the required exposure assessment.

2. Protective Clothing: Provide only disposable protective clothing with material composition of layered polypropylene or spun-bonded polyethylene nonwoven material. Disposable protective clothing is to be worn once and disposed of as asbestos-contaminated waste upon exiting from the work area. Suits shall have zipper front and attached hood and shoe covers. "Tyvek" by DuPont, or approved equal are acceptable disposable coveralls. Gloves will be worn for hand cover as required.

3. Wetting Agents - The asbestos material will be sprayed with water containing an additive to enhance penetration. The additive, or wetting agent, will be polyoxyethylene at a concentration of one (1) ounce per five (5) gallons of water, or equal. A fine spray of this solution must be applied to prevent fiber disturbance preceding the removal of the asbestos material. The asbestos will be sufficiently saturated to prevent emission of airborne fibers in excess of the exposure limits prescribed in the current OSHA standards referenced in these specifications. <u>Dry removal will not be allowed except with written approval.</u>

4. Polyethylene sheeting: Actual thickness must be six (6) mils, for drop cloths beneath the work area to collect debris. Industry Standard "6 mil" sheet is not acceptable.

5. Polyethylene bags (with warning labels) six mil (.006") minimum for disposal. All asbestos that is removed shall be double bagged.

6. Tape: High quality vinyl or fabric duct tape.

7. Airless Spray Equipment: Electric airless spray equipment for saturating and mist fiber control. Low-pressure (500 psi) equipment must be available on-site and utilized as required.

8. Vacuum: HEPA rated for surface cleaning and housekeeping. Hand operated and power tools such as, but not limited to, saws, scorers, abrasive wheels and drills should be provided with local exhaust ventilation systems with HEPA filters.

9. Hand tools: Brooms, plastic shovels, scrapers, brushes, etc., in sufficient quantity to ensure the appropriate level of housekeeping.

10. GFI Equipment: All electrical connectors in the work area must be through "ground fault" protected outlets/circuits.

11. SDS/MSDS for all materials shall be submitted to independent testing agency and kept on site.

B. PERSONNEL PROTECTION

1. Personnel protection is required for laborers, mechanics, supervision and visitors at the work site during the set-up and abatement operations.

2. Each worker shall be supplied with a minimum of two (2) complete protective work clothes and respirator filter changes per day for the complete duration of the project. Hard hats should be available as appropriate which meet ANSI Z-89.1 standards. Safety toe footwear is to be worn underneath the disposable or recyclable shoe coven and must meet the requirements and specifications in ANSI Z-41-1. Eye wear and face protection must meet the standards and specifications of ANSI Z-87.1.

3. In addition to sets of protective work clothes for workers, the Contractor shall have on hand two (2) additional sets of disposable work clothes per day for personnel who are authorized to inspect the work site. Hard hats should be available as appropriate which meet ANSI Z-89.1 standards. Safety toe footwear is to be worn underneath the disposable or recyclable shoe covers and must meet the requirements and specifications in ANSI Z-4 I-1. Eye wear and face protection must meet the standards and specifications of ANSA Z-87.1.

4. Respirators approved for asbestos use and protective work clothes will be worn by laborers and mechanics as a minimum during set-up operations (plastic draping, light-fixture dropping or removal, etc.).

5. Appropriate respirators will be worn by all personnel in the active work area.

6. Upon leaving the active work area, filters will be discarded, cartridges removed and respirators cleaned in disinfectant solution and clean water rinse.

7. Clean respirators will be stored in plastic bags when not in use.

8. Respirators will be inspected daily for broken, missing, or deteriorated parts.

PART 3 - EXECUTION

3.1 AREA PREPARATION:

A. Post warning signs meeting the specifications of OSHA 29 CFR 1926.1101 at the regulated area to restrict access to authorized personnel.

B. Prior to start of work, and as needed during the job, the Asbestos Abatement Supervisor shall inspect the work site and determine whether the asbestos containing brake shoes are non-friable asbestos containing material and will likely remain non-friable asbestos containing material during removal activities.

C. Establish a regulated work area using barrier tape or temporary barriers sufficient to prevent entry by unauthorized personnel. Provide polyethylene drop cloths beneath the work to capture debris

3.2 WORK PROCEDURE:

A. General Procedures: The work area shall be established as a regulated area in accordance with OSHA 29 CFR 1926.1101. Removal of the asbestos-containing elevator brake shoes shall be performed using OSHA Class II work practices appropriate for disturbance of Category II non-friable asbestos-containing materials. The material shall be removed intact to the extent feasible.

B. Work Practices: Wet methods, prompt containerization, and HEPA vacuuming and wet wiping shall be used to control debris. Grinding, sanding, cutting, or abrasive disturbance of the brake shoes is prohibited.

C. Regulatory Compliance: The Contractor shall comply with OSHA 29 CFR 1926.1101 for worker protection and work practices and with 40 CFR 61 Subpart M for waste handling and disposal, as applicable.

3.3 ASBESTOS BRAKE SHOE REMOVAL: All work shall be performed in accordance with OSHA Construction Industry Standard (29 CFR 1926.1101) and EPA NESPHAP Standard (40 CFR 61, Subpart M). An AHERA accredited Asbestos Abatement Supervisor shall be on the job during all abatement activities to ensure proper work practices throughout the project.

A. General: The work consists of the controlled removal and disposal of asbestos-containing elevator brake shoes associated with elevator modernization activities. Removal shall be performed using methods that maintain the material in an intact condition and prevent the material from becoming friable.

B. Work Area: Establish a regulated work area around the immediate brake assembly using warning tape, barriers, or temporary isolation sufficient to restrict access to authorized personnel only. Post asbestos warning signs at each entry point.

C. Work Practice: Remove brake shoes intact to the maximum extent feasible. Grinding, sanding, drilling, cutting, or abrading the material is prohibited. Mechanical power tools shall not be used on asbestos-containing components unless equipped with HEPA-filtered local exhaust ventilation and specifically approved by the Contracting Officer.

D. Wetting: The brake shoes and adjacent contact surfaces are to be kept wet with amended water to minimize fiber release prior to and during removal.

E. Asbestos-containing Brake Shoe Removal: Detach the brake shoes from the elevator assembly using manual hand tools. Avoid methods that may damage the components. Handle the material in a non-destructive manner to minimize breakage and dust generation. Removed components

shall be immediately placed into a labeled, leak-tight container or double 6-mil polyethylene bags and sealed with tape. Label asbestos waste in accordance with EPA labeling requirements.

F. Cleaning Work Area: Vacuum the remaining dust with a HEPA vacuum cleaner. Dispose of the dust as regulated asbestos containing material.

G. Transporting: Carry the materials to a container for transport to an EPA approved landfill. Record of shipment is to be provided to contracting officer.

3.4 ADDITIONAL WORK PROCEDURES

A. Vacuum any remaining material from sub surfaces.

B. All polyethylene, tape, clothing and cleaning materials shall be bagged and disposed of as specified.

C. Clean all equipment, tools, etc., prior to removing them from work area.

D. Remove polyethylene drop cloths and discard like asbestos-contaminated materials.

E. Place asbestos-containing and asbestos-contaminated material while still wet into sealable, opaque or colored six (6) mil polyethylene bags. Do not overfill, place more than twenty-five (25) pounds into it or use it for disposal of sharp-edged materials.

F. Evacuate the bag with HEPA vacuum and seal collapsed bag by twisting top six (6) inches closed and wrapping with a minimum of two (2) layers of duct tape.

G. Twist top and fold over, apply second wrap of duct tape.

H. Clean outside of disposal bag by wet wiping and take bag to the equipment and staging area.

I. Affix warning and identification labels to opaque or colored bag and then place bag inside a second, six (6) mil polyethylene bag.

J. Seal outer bag by repeating steps F and G.

K. Double-bagged waste shall be placed into a lined, covered receptacle or dumpster. Wastes must not remain on the ground.

L. HEPA filter unit to remain in place until space has been cleared by a final inspection.

M. The Contracting Officer or his designated representative will perform a visual inspection to verify all ACM has been removed.

N. Any alternate method of removal must have the written approval of the Contracting Officer or his designated representative.

3.5 HOUSEKEEPING: Essential parts of asbestos dust control are housekeeping and cleanup procedures. Maintain all surfaces throughout the building free of accumulations of asbestos fibers to prevent further dispersion. Give meticulous attention to restricting the spread of dust and debris, keep waste from being distributed over the general area or to lower floors. Use approved industrial vacuum cleaners with a HEPA filter to collect dust and small scrap. The blowing down of the space with compressed air is forbidden. Post appropriate asbestos hazard warning signs. In all possible instances workmen shall cleanup their own areas. Equip personnel engaged in cleaning up asbestos scrap and waste with necessary respiratory equipment and protective clothing. Throughout the work period, maintain the building and site in a standard of cleanliness as specified throughout these specifications.

A. Contaminated disposable clothing, respirator filters and other debris will be bagged, properly

labeled and sealed at the end of each workday.

B. All asbestos generated by removal, encapsulation or repair will be bagged, properly labeled, and sealed at the end of each workday.

C. Respirators will be thoroughly cleaned at the end of each workday and stored for the next day's use.

D. Retain all stored items in an orderly arrangement allowing maximum access, not impeding traffic, and providing the required protection of materials.

E. Do not allow the accumulation of scrap, debris, waste material, and other items not required for completion of this work.

F. At least weekly, and more often is necessary, completely remove all scrap, debris and waste material from the job site.

G. Unless otherwise noted or directed, materials resulting from demolition operations shall be the property of the Contractor, shall not be used in the work and shall be promptly removed from the site.

H. Daily and more often if necessary, inspect the work areas and adjoining spaces, and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.

I. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.

J. Maintain the site in a neat and orderly condition at all times.

K. Compressed air is not to be used for cleaning purposes.

3.6 DISPOSAL:

A. Permits and Notifications: Comply with applicable federal requirements for asbestos waste handling, transportation, and disposal. Provide EPA asbestos notification only if required by 40 CFR 61 Subpart M. Provide notification in accordance with 40 CFR 61.22(d)(1).

B. Collect and dispose of asbestos containing waste, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers in leak-tight containers. Prior to placing in bags, or containers, wet down asbestos wastes to reduce airborne concentrations. All asbestos materials and miscellaneous debris will be transported to the pre-designated disposal site in accordance with the guidelines of the U.S. Environmental Protection Agency, Tide 40, Part 61, Subpart M, and all local agencies' regulations.

C. The disposal facility shall be authorized to accept asbestos containing waste.

D. Obtain signed waste shipment record indicating material is asbestos waste, and site it came from. Waste disposal manifests must also indicate amount of waste in cubic yards or tons.

E. The contractor will provide the Contracting Officer or his designated representative with a copy of all Waste Shipment Record, haulers receipts or landfill receiving tickets resulting from the disposal of the asbestos waste. Establishment of any on-site temporary holding

area for properly packaged asbestos waste must be approved by the Contracting Officer or his designated representative.

3.7 RECORDKEEPING AND LOG

A. Maintain a daily log documenting the following items:

B. PERSONNEL PROTECTION

C. Personnel protection is required for laborers, mechanics, supervision and visitors at the

1. Date(s) of asbestos removal work.
2. Location of work performed.
3. Special or unusual events, such as power loss or equipment failure.
4. Amount of asbestos-containing material removed from the work site.
5. Work progress narrative.

**SHIPPING MANIFEST**

**REPORTABLE QUANTITY, HAZARDOUS SUBSTANCE, SOLID, N.O.S.**
**ORM-E NA 9188 (ASBESTOS)**

Total Quantity of Hazardous Substance:

_____Bags
_____Drums
_____Cubic Yards
_____(Other Unit)

Waste Generator:
(Building Name)
BLDG NO:_____
GSA Contract #:

Name:_____

Address:_____

_____

Waste Pickup Site:

Name:_____

Address:_____

_____

Waste Transporter:
(Prime Contractor)

Name:_____

Address:_____

_____

Disposal Facility:

Landfill Name:_____

Contact:_____

Address:_____

Phone:_____

_____ZIP_____

**NOTE: THIS FORM SHALL BE SIGNED BY EACH PARTY AS CONTROL OF THE HAZARDOUS SUBSTANCE IS RELINQUISHED TO THE NEXT PARTY.**

| RECEIVED FROM Name, Representing | DATE | RECEIVED BY Name, Representing | DATE |
|---|---|---|---|
| 1._____ | _____ | _____ | _____ |
| 2._____ | _____ | _____ | _____ |
| 3._____ | _____ | _____ | _____ |
| 4._____ | | | |



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**APPENDIX A GSA ASBESTOS ABATEMENT PROJECT CONTROL CHECKLIST**
**020850 Asbestos Contractor Submittal Punch List**

PROJECT_____
PROJECT NUMBER_____
DATE REVIEWED_____
REVIEWER_____

_____ABATEMENT___FLOOR TILE__ROOFING__OTHER

A. Pre-Award Submittals**:** Items Submitted After Bid Receipt But Prior to Award:

Asbestos Contractor Qualification Information

| | REVIEWED | APPROVED | IN FILE |
|---|---|---|---|
| *1. Record of firms' experience, including names and addresses of purchasers of service, location of work, and dates of performance (Section 1.4.A.1.) | _____ | _____ | ____ |
| *2. Copy of daily log and air monitoring reports for last five jobs, (Section 1.4.A.2.) | _____ | _____ | ____ |
| *3. Name of Superintendent: (Section 1.4.A.3.) | | | |
| a. Record of experience | _____ | _____ | ____ |
| b. Record of training | _____ | _____ | ____ |
| *4. Names and experience record of employees: (Section 1.4.A.4.) | | | |
| a. Record of experience | _____ | _____ | ____ |
| b. Copy of successful completion record for required training. | _____ | _____ | ____ |
| *5. Current State License: (Section 1.4.A.5.) | | | |
| a. Pennsylvania | _____ | _____ | _____ |



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B. Post-Award Asbestos Abatement Submittals: Items to be submitted after award, but prior to beginning work:

| | REVIEWED | APPROVED | IN FILE |
|---|---|---|---|
| 1. Plan of Action: (Section 1.4.B.1.) | | | |
| a. Work plan showing location and layout of decontamination areas | _____ | _____ | ____ |
| b. Notification of EPA (Section 1.4.B.3.) | _____ | _____ | ____ |
| c. Notification of Local jurisdiction (Section 1.4.B.4.) DC/VA/MD | _____ | _____ | ____ |
| d. Scheduling/sequencing of work | _____ | _____ | ____ |
| e. Interface of other trades in work schedule | _____ | _____ | ____ |
| f. Methods used to ensure safety of building occupants and visitors | _____ | _____ | ____ |
| >>>> Air to be monitored by GSA /Tenant /Contractor | _____ | _____ | ____ |
| g. Disposal of waste, location of site, and permit from Owner and regulatory authority (1.4.B.2.) | _____ | _____ | ____ |
| h. Type of HEPA ventilation system | _____ | _____ | ____ |
| i. How will contractor close off and ensure that there are no leaks in building's HVAC system in contractor's work area | _____ | _____ | ____ |
| j. Methods of removal to be utilized | _____ | _____ | ____ |
| 2. Certificates of Compliance: (Section 1.4.B.5.) | | | |
| a. HEPA Vacuums | _____ | _____ | ____ |
| b. HEPA Ventilation equipment | _____ | _____ | ____ |
| c. Respirators | _____ | _____ | ____ |
| d. Other information | | | |



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3. Information on Encapsulants: (Section 1.04.B.6.)

Compliance with Specification
EPA requirements _____ _____ ____

USED AS ENCAPSULANT____, FLAMMABLE _____

SPRAYBACK____, OR COMBUSTIBLE _____

WETTING AGENT____, NONCOMBUSTIBLE _____

4. Laboratory Qualification Information: (Section 1.04.B.7.)

a. Name and location of firm _____ _____ ____

b. Proof of current accreditation _____ _____ ____

c. Certification of Microscopist _____ _____ ____

C. During-Work Asbestos Abatement Submittals: Items 1.4.C.1. through 1.4.C.2. below are to be submitted to the contracting officer or his designated representative as work progresses at the time specified:

| | REVIEWED | APPROVED | IN FILE |
|---|---|---|---|
| 1. Air Monitoring Results.(1.4.C.1.a.) | _____ | _____ | _____ |
| 2. Differential Air Pressure Readings. (Strip Charts) (1.4.1.b.) | _____ | _____ | _____ |
| 3. Work Area Inspections. (1.4.C.1.c.) | _____ | _____ | _____ |
| 4. Disposal Receipts. (1.4.C.2.a.) (NESHAPS Waste Shipment Records) | _____ | _____ | _____ |
| a. Quantity of material listed. | | | |
| b. Receipt signed and dated. | | | |
| 5. Transportation Vehicles(1.4.C.2.b.) | _____ | _____ | _____ |
| a. Dedicated Asbestos Vehicle. | | | |
| b. Marked In Accordance With DOT and NESHAPS regulations. | | | |
| 6. NESHAPS Waste Shipment Records.(1.4.C.2.c.) | _____ | _____ | _____ |
| a. Quantity of material listed | | | |
| b. Receipt dated | | | |
| c. Receipt signed by authorized representative of landfill | | | |

D. Final Submittals: Items 1.4.D.1. and 1.4.D.2. below are to be submitted to the contracting officer's designated representative at the completion of work for each containment.



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| | REVIEWED | APPROVED | IN FILE |
|---|---|---|---|
| 1. Daily Log (1.4.D.1.) | _____ | _____ | ____ |
| 2. Removal and Reestablish Systems Certification. (1.4.D.2.) | _____ | _____ | ____ |
| a. Description of Materials Removed. (1.4.D.2.a.) | _____ | _____ | ____ |
| b. Final Inspection Completed. (1.4.D.2.b.) | _____ | _____ | ____ |
| c. Restoration of Systems. (1.4.D.2.c.) | _____ | _____ | ____ |

E. GSA Asbestos Abatement Project Control and Close Out

| | REVIEWED | APPROVED | IN FILE |
|---|---|---|---|
| a. Copy of EPA and Local Notifications | _____ | _____ | ____ |
| b. Copy of Project Specifications. | _____ | _____ | ____ |
| c. Independent Air Monitoring Report. | | | |

F. **Notes**: _____

_____

_____

_____

| | | | |
|---|---|---|---|
| WPMOX: Air Monitoring Ordered. | _____ | _____ | ____ |
| WPMOX: Length of Job. (Scheduling) | | | |

END OF SECTION 020850



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# SECTION 020900 – REMOVAL AND DISPOSAL OF LEAD-BASED PAINT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. Section Includes:

1. Removal and Disposal of Lead-Based Paints (LBP).

B. Related Sections:

1. Section 015950 “Safety and Health”

The work outlined in this document supports the lead-containing paint stabilization at the UNICOR Building 400 1st Northwest, Washington, District of Columbia 20534. In general terms, the project will include removal of loose and flaking lead-based painted coatings on the penthouse metal stair handrail, which may be disturbed during the upcoming elevator modernization project.

### 1.3 DESCRIPTION OF WORK

A. General: This section establishes requirements for worker protection, dust control, and waste handling during disturbance of existing lead-containing paint coatings associated with renovation activities. It applies to the disturbance of existing lead-based paint coatings and implementation of lead-safe work practices.

1. Work Area: The work areas include the following:

a. See Appendix I for locations and materials.

PSI conducted a limited pre-renovation screening for lead-based paint (LBP) at the UNICOR Office, 400 1st Street NW, Washington, DC, in support of the planned elevator modernization project. The survey was limited to areas anticipated to be disturbed by the renovation activities. XRF testing identified lead-based paint exceeding regulatory thresholds on a penthouse metal handrail, and additional painted surfaces exhibited detectable lead, including a measured concentration of approximately 1.5% by weight via XRF analysis.

B. Where lead-containing coatings are disturbed, the Contractor shall implement lead-safe work practices and localized dust control measures to minimize personnel exposure and migration of dust.

C. In situations where LBP surfaces will be disturbed, but not demolished (i.e. drilling, cutting and scraping), utilize wet methods, HEPA vacuums and/or tools equipped with HEPA filtered vacuum collection systems.

## 1.4 QUALITY ASSURANCE

A. Contractor Qualifications: The Contractor shall be a firm of established reputation (or if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of skilled employees, and shall have performed this work on previous projects.

B. Acceptability of Work: Determination of acceptability of a work area following renovation actions will be based on a combination of visual inspections and surface sampling. Visual inspections will be performed by the Contracting Officer of his designated representative in areas where removal work is performed. Dust wipe sampling may be performed in work areas where lead-containing paints or coatings are sanded, abraded or otherwise separated from applied architectural finish.

C. Dust Wipe Sampling: The Contracting Officer of his designated representative will collect dust wipe samples from horizontal surfaces for lead content using standard procedures if areas with lead-based paints are disturbed during the project. Sample preparation involves digesting the dust wipe samples in dilute nitric acid followed by Flame Atomic Absorption analysis (FAA).

## 1.5 SUBMITTALS

A. The following submittals are required to be approved by the Contracting Officer (CO) prior to bid award.

1. Contractor shall have a Competent Person as defined by OSHA 29 CFR 1926.62.
2. Three Projects: Name and Location of at least 3 lead abatement projects performed by the Contractor, including names and telephone number of contract representatives.
3. Three Project Reports: Copy of daily log and air monitoring reports (including final wipe tests where applicable) of the last 3 abatement projects submitted above.
4. Names and qualifications (experience and training) of supervisor and personnel who will be working on-site.
5. Evidence of current training in LBP abatement by an EPA accredited program, or equivalent. Evidence of successful completion of LBP Worker and Competent Person training, describing the training provider, subject matter, duration and dates of the course.
6. Name and qualification of analytical laboratory to be used to analyze personal exposure samples and to profile wastes.
7. Names and qualifications of each contractor that will be transporting, storing, treating, recycling, and/or disposing of the wastes. Include the facility location, phone number, and a 24-hour point of contact.

B. The following submittals are required to be approved after award, but prior to beginning work:

1. Detailed site-specific work plan to indicate the means for demarcating the work area and providing for decontamination by workers, protecting the occupants, general public and other trades, and adjacent building surfaces and furnishings from contamination.
2. Methods and materials for lead-based paint abatement and/or the engineering controls to be used when disturbing lead-based surfaces (enclosures, dust control and collection mechanisms, etc.) A material safety data sheet (MSDS) shall be provided for all chemical removers proposed for use.
3. Work plan for waste containment, removal, and disposal. Wastes shall be cleaned-up and containerized daily.

C. The following submittals are required to be submitted to the CO or designated representative at the completion of work:

1. Code of Federal Regulations (CFR):

a. Occupational Safety and Health Act (OSHA)

1) 29 CFR 1910, OSHA General Industry Standard
2) 29 CFR 1910, 1025, OSHA General Industry for Lead
3) 29 CFR 1926, OSHA Construction Standard
4) 29 CFR 1926.62, OSHA Lead in Construction with West Virginia Amendments

b. Environmental Protection Agency (EPA):

1) 40 CFR 260-299, EPA Resource Conservation and Recovery Act
2) 40 CFR 300-399, EPA Comprehensive Environmental Response Compensation & Liability Act.
3) 40 CFR 745, EPA Toxic Substances Control Act; Lead-Based Paint Poisoning Prevention

c. Department of Transportation (DOT):

1) 49 CFR 171-180, DOT Hazardous Material Regulations

2. Other Recognized Standards

a. American National Standards Institute (ANSI) Publication:

1) Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems

b. US Department of Housing and Urban Development (HUD)

1) Guidelines of the Evaluation and Control of Lead-Based Paint Hazards in Housing

3. State and Local Regulations:

a. Applicable state and local regulations shall apply.

PART 2 - PRODUCTS

2.1 PAINT AND ADHESIVE REMOVER

Products containing Methylene Chloride are prohibited. Liquid paint/adhesive removers shall be a type recommended by the manufacturer for removing paint or adhesive from each substrate without causing undue damage to the substrate. Materials used are to be of limited toxicity, volatility, and flammability. A material safety data sheet (MSDS) and other appropriate product information for all chemicals proposed for use shall be submitted to the Architect for approval.

2.2 VACUUMS

A. All vacuums used during paint and adhesive removal, disturbance, and clean up shall be equipped with HEPA filters conforming to ANSI Z9.2-1979

2.3 SHEET PLASTIC DROP CLOTH

A. Provide fire retardant polyethylene film in the largest size possible to minimize seams, 4.0 or 6.0 mils thick as indicated, clear, frosted or black as indicated.

2.4 PROTECTIVE CLOTHING

At a minimum, workers should wear disposable coveralls including shoe covering. Use special precautions if chemical strippers will be used (appropriate clothing, gloves, and face shields per MSDS recommendations). The contractor shall containerize disposable coveralls as abatement waste on a daily basis. All workers shall be trained on the hazards of lead and proper personal hygiene, such as no eating/drinking/smoking in the work area, and washing when leaving the work area.

A. Coveralls: Provide disposable full-body coveralls and disposable head covers, and require that they be worn by all workers in the Work Area. Provide a sufficient number for all required changes, for all workers in the Work Area.

B. Gloves: Provide work gloves to all workers and require that they be worn at all times in the Work Area. Do not remove gloves from Work Area and dispose of as contaminated waste at the end of the work.

C. Safety Glasses: Provide safety glasses to all workers and require that they be worn at all times in the Work Area.

2.5 AIR PURIFYING RESPIRATORS

A. At a Respirator Bodies: Provide full or half face air purifying respirators.

B. Filter Cartridges: Provide, at a minimum, combination HEPA type P100 filters labeled and color-coded in accordance with NIOSH Certification.

2.6 POLYETHYLENE SHEET

A. Impermeable fire retardant polyethylene sheeting drop cloths shall be placed on surfaces beneath all work impacting lead-based paint coatings. Provide polyethylene sheeting in the largest size possible to minimize seams, 6.0 mil thick, clear, frosted or black as indicated.

2.7 DISPOSAL BAGS

A. Provide 6 mil thick leak-tight polyethylene bag.

2.8 MISCELLANEOUS MATERIALS

A. Duct Tape: Provide duct tape in 2" or 3" widths as indicated, with an adhesive, which is formulated to stick aggressively to sheet polyethylene.

B. Spray Cement: Provide spray adhesive in aerosol cans, which is specifically formulated to stick tenaciously to sheet polyethylene.

PART 3 - EXECUTION

3.1 PROTECTION, GENERAL

A. Demarcate the Work Area and restrict access by providing a taped-off and labeled perimeter around the Work Area where lead-based paint is impacted during work.

B. Provide barriers and signage sufficient to restrict access and prevent the migration of dust and debris beyond the immediate work area.

C. All work areas (interior and exterior) are to be pre-cleaned of dust, debris, and paint chip accumulation prior to establishing barriers. Dust generation is to be minimized by misting interior

painted surfaces with water during removal. Use caution to minimize damaged to adjacent surfaces and historic substrate materials

D. Interior work resulting in minor impact to lead painted surfaces, using controlled work practices, and other activities that control the generation of lead dust shall be performed over a 6-mil polyethylene drop cloth that extends to at least 10 feet out to protect adjacent/horizontal surfaces from the accumulation of lead dust and debris.

E. Lead-disturbing activities shall be performed using localized containment and lead-safe work practices. Provide polyethylene drop cloths and barriers as necessary to prevent the migration of dust and debris beyond the immediate work area. Full enclosure containment and negative pressure ventilation are not required. Dry sanding, grinding, or abrasive blasting is prohibited unless equipped with HEPA shrouded tools.

F. Exterior demolition and disturbance shall be completed over 6-mil. Polyethylene drop cloths that shall be containerized on a daily basis. For elevated work areas, additional precautions may be required to prevent the dispersion of lead dust and debris.

G. For exterior demolition and paint disturbance at windows, an airtight polyethylene barrier shall be placed over the interior side of window openings and wall penetrations, mechanical systems intakes and outlets, etc.

H. Wet methods using a TSP solution, a high-detergent cleanser or a product of proven equivalent effectiveness for cleaning and/or controlling lead dust shall be implemented for all lead paint disturbances unless proven unfeasible. Alternative control methods and products must be submitted for approval prior to implementation

I. Minimum respiratory protection is half-face with appropriate HEPA filter with a protection factor of 10 for work environments up to 300 $\mu g/m^3$

J. OSHA Compliance: Contractors and their employees who are potentially exposed to lead levels in excess of the OSHA Action Limit (30 $\mu g/m^3$) must comply with the OSHA requirements for medical surveillance, exposure monitoring and training and education. The Contractor must conduct all OSHA required abatement monitoring and medical surveillance at no cost to the Owner.

3.2 PREPARATION

A. Prior to commencing work, comply with requirements for Worker and Respiratory Protection.

B. Do not allow eating, drinking, smoking and chewing tobacco or gum in the Work Area

C. Before beginning lead paint removal in any area, pre-clean and cover all surfaces, furnishings, and stored items which may accumulate dust and paint chips with 6-mil. Plastic sheeting taped securely in place. Barriers shall be adequate to ensure that dust, debris, and fumes are contained within the work area and do not contaminate building systems or adjacent surfaces.

D. Seal supply and vents, and convectors within ten (10) feet of the Work Area with 6-mil fire retardant polyethylene sheeting secured and completely sealed with duct tape. The use of spray adhesive on historic surfaces is prohibited

E. OHSA Warning signs shall be placed at the entrance to LBP work control areas.

F. All lead-disturbing activities shall be conducted using controlled work practices and localized containment sufficient to control debris.

G. For exterior or open area work, provide construction tape barriers at an adequate distance around the work area for pedestrians to follow to alternate pathways.

H. Hallways, exits and stairwells and similar routes of egress shall not be blocked without the permission of the Contracting Officer.

I. Prior to initiating work, obtain from the building manager a secure waste storage area. Any waste storage area shall be locked and protected with 6-mil. Poly sheeting on floors and partially up walls.

3.3 WORK PROCEDURES

A. The method of lead-based paint abatement removal chosen by the contractor must minimize the generation of lead dust. The following methods of paint removal will not be permitted: open-flame burning, dry scraping, and machine sanding/grinding/cutting without HEPA attachments.

B. Coordinate work of all trades to ensure that their work is performed in accordance with applicable regulations and to ensure the integrity of isolation of the regulated area.

C. The Contractor is responsible for personal air monitoring under OSHA regulations and to document and control worker exposure. OSHA regulations include provisions for exposure monitoring, engineering and work practice controls, training, medical monitoring, recordkeeping, and job removal. The Contractors' "Competent Person" shall evaluate the data to determine the effectiveness of engineering controls, the adequacy of personal protective equipment, and to determine if proper work practices are being employed. The CO shall be notified if any air monitoring results equal or exceed 30 micrograms per cubic meter of air (ug/m3).

D. In obtaining a negative exposure assessment (NEA), and employer may not project another employers' results to their personnel. Additional exposure monitoring is required when there is a change in equipment, processes, controls, or when personnel of varying training and/or experience are engaged in the process.

E. Government representatives may perform environmental testing prior to beginning work to demonstrate that there is no appreciable elevation of airborne or settled lead outside of the work area. Sampling may also be performed during the initial phase of removal to assure lead levels remain under the OSHA action level of 30 ug/m3.

F. Upon exiting the removal area, personnel shall decontaminate by vacuuming gross debris from disposable clothing and thoroughly washing all exposed body surfaces. The contractor is responsible for supplying adequate washing facilities for their employees. Workers shall not leave the designated work area while wearing protective clothing.

3.4 CLEANING AND DISPOSAL

A. Housekeeping: Surfaces in the LBP control area shall be maintained free of accumulations of paint chips and dust. The accumulation and spread of dust and debris shall be restricted. Dry sweeping or compressed air shall not be used for cleanup.

B. The General Contractor is responsible for ensuring that normal shop vacuums, or other vacuums without HEPA filtration, are not utilized in areas where and accumulation of lead dust or paint chips can reasonably be anticipated.

C. At the end of each work period, HEPA vacuum and collect all debris to maintain surfaces free of paint chips and dust accumulation. Seal debris in airtight containers and remove from work site. Materials being temporarily stored at the site must be transported and maintained in closed, airtight containers (drums) meeting DOT requirements.

D. Final cleaning/approval: HEPA vacuum and damp clean areas and surfaces with an anionic solution such as trisodium phosphate (TSP), vinegar, or high detergent solutions. The area shall

be visually clean of all debris and dust. If the CO or a designated representative (i.e. and IH firm) finds the area unacceptable, the contractor shall re-clean until acceptance is gained.

E. In accordance with 40 CFR 745, child-occupied facilities and target housing must follow the final clearance wipe testing protocols established therein. In all instances, the CO and/or a designated representative will make the determination of individuals or composite sampling.

F. For facilities and/or projects not included under paragraph 3.3E, the CO and/or a designated representative will determine if lead dust wipe samples will be collected to establish acceptance after final cleaning. When final wipe testing is utilized, the clearance criterial shall be as follows:

| **Surface** | **Clearance Criteria** |
|---|---|
| Floors | 40 micrograms lead per square foot |
| Window Sills | 250 micrograms lead per square foot |
| Exterior and “Other” Surfaces | 800 micrograms lead per square foot |
| Soil | 1,200 micrograms lead per gram |
| Soil (Children’s Play Area) | 400 micrograms lead per gram |

G. Handling and disposal of all waste and debris is to be in compliance with OSHA, EPA, DOT, applicable state, and all other applicable regulations. The contractor is responsible for providing a waste profile and quantity report, and for providing TCLP (toxic characteristic leaching procedure) sampling to determine if the waste is hazardous.

H. Solid Waste Disposal: Solid waste that has been evaluated and determined not to be hazardous can be disposed of in a state approved landfill as construction debris. Waste should be transported to the approved disposal landfill in covered vehicles

I. Hazardous Waste Disposal: Hazardous waste must be disposed of at a hazardous waste disposal facility, usually defined as a treatment, storage, and disposal facility (TSD).

J. Carefully load containerized waste in fully enclosed dumpsters, trucks or other appropriate vehicles for transport. Exercise care before and during transport, to insure that no unauthorized persons have access to the material. Vehicle must be placarded with DOT label. Advise the landfill operator or processor, in advance of transport, of the quantity of material to be delivered.

K. All waste is to be hauled by a waste hauler with all required licenses from all state and local authority with jurisdiction. Seal lead waste in leak-proof impermeable containers labeled in accordance with EPA requirements

L. Disposal Site Procedures: At the disposal site, sealed polyethylene bags shall be carefully unloaded from the truck. If bags are broken or damaged, return to work site for re-bagging. Clean entire truck by HEPA vacuum and wet wipe methods.

M. A copy of each manifest is to be provided to the CO and designated facility contact at the time the shipment is made. Within 30 days of the time of the Hazardous Waste Treatment Storage and Disposal Facility (TSDF) receives the waste a completed copy of the manifest is to be provided to the CO and facility contact. Certificates of Destruction or Disposal (CD) shall be provided to the same parties within 90 days of delivery of waste to the TSDF.

END OF SECTION 020900

# SECTION 024119 - SELECTIVE DEMOLITION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

B. Related Requirements:
1. Section 017310 "Cutting and Patching" for cutting and patching procedures.
2. Section 020850 “Asbestos Abatement Procedures” for removal and disposal of asbestos-containing materials.
3. Section 020900 “Removal and Disposal of Lead-Based Paint” for removal and disposal of lead-containing materials.

### 1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

### 1.3 MATERIALS OWNERSHIP

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

### 1.4 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 areas where existing construction is to remain and requires protection.

### 1.5 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, and dust control Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services. Indicate how long utility services will be interrupted.

C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

## 1.6 QUALITY ASSURANCE

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

## 1.7 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify the CO of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

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

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

1. Maintain fire-protection facilities in service during selective demolition operations.

## 1.8 COORDINATION

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey of Existing Conditions: Record existing conditions by use of measured drawings and correlate with requirements indicated to determine extent of selective demolition required.

3.2 PREPARATION

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

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off utilities with utility companies.
   2. Disconnect, demolish, and remove plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
      c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.

B. Remove temporary barricades and protections where hazards no longer exist.

## 3.5 SELECTIVE DEMOLITION, GENERAL

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

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least four hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition

## 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

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

B. 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.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

## 3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

## 3.8 CLEANING

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

END OF SECTION 024119

# PART 1 - SECTION 030130 - MAINTENANCE OF CAST-IN-PLACE CONCRETE

## 1.1 SUMMARY

A. Section Includes:

1. Repair of spalled concrete.
2. Epoxy crack injection.

## 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

## 1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For concrete-maintenance specialist and manufacturers.

## 1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Each manufacturer shall employ factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

B. Concrete-Maintenance Specialist Qualifications: Engage an experienced concrete-maintenance firm that employs installers and supervisors who are trained and approved by manufacturer to apply packaged patching-mortar and to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing or patching new concrete is insufficient experience for concrete-maintenance work.

# PART 2 - PRODUCTS

## 2.1 BONDING AGENTS

A. Epoxy Bonding Agent: ASTM C 881/C 881M, bonding system Type V and free of VOCs.

B. Latex Bonding Agent, Non-Redispersible: ASTM C 1059/C 1059M, Type II for use at structural and exterior locations and where indicated].

## 2.2 PATCHING MORTAR

A. Patching Mortar Requirements:

1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
2. Coarse Aggregate for Patching Mortar: ASTM C 33/C 33M, washed aggregate, Size No. 8, Class 5S. Add to patching-mortar mix only as permitted by patching-mortar manufacturer.

B. Polymer-Modified, Cementitious Patching Mortar: Packaged, dry mix for repair of concrete and that contains a non-redispersible latex additive as either a dry powder or a separate liquid that is added during mixing.

1. Compressive Strength: Not less than 4000 psi (27.6 MPa) at 28 days when tested according to ASTM C 109/C 109M.

## 2.3 EPOXY CRACK-INJECTION MATERIALS

A. Epoxy Crack-Injection Adhesive: ASTM C 881/C 881M, bonding system Type IV at structural locations and where indicated, Type I at other locations; free of VOCs.

1. Capping Adhesive: Product manufactured for use with crack-injection adhesive by same manufacturer.

## 2.4 MISCELLANEOUS MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I, II, or III unless otherwise indicated.

B. Water: Potable.

## 2.5 MIXES

A. General: Mix products, in clean containers, according to manufacturer's written instructions.

1. Do not add water, thinners, or additives unless recommended by manufacturer.
2. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.

## PART 3 - EXECUTION

### 3.1 CONCRETE MAINTENANCE

A. Have concrete-maintenance work performed only by qualified concrete-maintenance specialist.

B. Comply with manufacturers' written instructions for surface preparation and product application.

### 3.2 PREPARATION

A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.

B. Protect persons, motor vehicles, surrounding surfaces of building being repaired, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.

1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
2. Use only proven protection methods appropriate to each area and surface being protected.
3. Provide temporary barricades, barriers, and directional signage to exclude public from areas where concrete maintenance work is being performed.
4. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
5. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
6. Protect floors and other surfaces along haul routes from damage, wear, and staining.
7. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape or a liquid strippable masking agent. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
8. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
9. Dispose of debris and runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

C. Preparation for Concrete Removal: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.

### 3.3 CONCRETE REMOVAL

A. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch (13 mm). Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.

B. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.

C. Remove additional concrete if necessary to provide a depth of removal of at least 1/2 inch (13 mm) over entire removal area.

D. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.

E. Provide surfaces with a fractured profile of at least 1/8 inch (3 mm) that are approximately perpendicular or parallel to original concrete surfaces. At walls, make top and bottom surfaces level unless otherwise directed.

F. Thoroughly clean removal areas of loose concrete, dust, and debris.

## 3.4 PATCHING MORTAR APPLICATION

A. Place patching mortar as specified in this article unless otherwise recommended in writing by manufacturer.

1. Provide forms where necessary to confine patch to required shape.
2. Wet substrate and forms thoroughly and then remove standing water.

B. Pretreatment: Apply specified bonding agent.

C. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.

D. Vertical Patching: Place material in lifts of not more than 1 inch (25 mm) or less than 1/4 inch (6 mm). Do not feather edge.

E. Consolidation: After each lift is placed, consolidate material and screed surface.

F. Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.

G. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a smooth surface with a wood or sponge float.

H. Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

## 3.5 EPOXY CRACK INJECTION

A. Clean cracks with oil-free compressed air or low-pressure water to remove loose particles.

B. Clean areas to receive capping adhesive of oil, dirt, and other substances that would interfere with bond.

C. Place injection ports as recommended by epoxy manufacturer, spacing no farther apart than thickness of member being injected. Seal injection ports in place with capping adhesive.

D. Seal cracks at exposed surfaces with a ribbon of capping adhesive at least 1/4 inch thick by 1 inch wider than crack.

E. Inject cracks wider than 0.003 inch to a depth of 8 inches.

F. Inject epoxy adhesive, beginning at widest part of crack and working toward narrower parts. Inject adhesive into ports to refusal, capping adjacent ports when they extrude epoxy. Cap injected ports and inject through adjacent ports until crack is filled.

G. After epoxy adhesive has set, remove injection ports and grind surfaces smooth.

## 3.6 FIELD QUALITY CONTROL

A. Manufacturers Field Service: Engage manufacturers' factory-authorized service representatives for consultation and Project-site inspection and to provide on-site assistance when requested by the COR.

1. Have manufacturers' factory-authorized service representatives perform the following number of Project-site inspections to observe progress and quality of the Work, distributed over the period of product installation, regardless of on-site assistance requested by COR:

a. Bonding-Agent and Packaged Patching-Mortar Installation: One inspection.
b. Crack-Injection-Adhesive Preparation and Installation: two inspections.

END OF SECTION 030130

# SECTION 048100 - UNIT MASONRY

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Face brick.
3. Mortar.

### 1.2 SUBMITTALS

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

### 1.3 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

### 1.4 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 CONCRETE MASONRY UNITS (CMUs)

A. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Weight Classification: Light weight, unless otherwise indicated.

### 2.2 BRICK

A. Face Brick: ASTM C 216, Grade SW, Type FBS.
1. Size: .Match existing brick.
2. Application: Use where brick is exposed, unless otherwise indicated.
3. Color and Texture: Match existing brick .

### 2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Masonry Cement: ASTM C 91.

B. Colored Cement Product: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color to match existing.

C. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

D. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

E. Water: Potable.

## 2.4 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For exterior, above-grade, load-bearing and non-load-bearing walls; and for other applications where another type is not indicated, use Type N.

# PART 3 - EXECUTION

## 3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from masonry repair work.

B. Prevent mortar from staining face of surrounding masonry and other surfaces.

## 3.2 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Matching Existing Masonry: Match coursing, bonding, and texture of existing masonry.

D. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602.

## 3.3 MORTAR BEDDING AND JOINTING

A. Lay CMU masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

## 3.4 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

END OF SECTION 048100

# SECTION 055000 - METAL FABRICATIONS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing to reinforce concrete roof deck at steel stair posts.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Elevator machine beams.
5. Metal ladders.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.

### 1.2 . SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

### 1.3 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

### 1.4 PROJECT CONDITIONS

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

### 1.5 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves,

concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

## PART 2 - PRODUCTS

### 2.1 METALS, GENERAL

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

### 2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

### 2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1).

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. High Strength Headed Anchor Rods: ASTM F1554, Grade 105, straight.

1. Nuts: ASTM A563 Grade DH heavy-hex carbon steel.
2. Washers: ASTM F436, Type 1, hardened carbon steel.

F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

G. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).

H. Wood Screws: Flat head, ASME B18.6.1.

I. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

J. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

K. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

L. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

## 2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

a. Shop Primers: Provide primers that comply with Division 09 painting Sections.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

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

## 2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form exposed work with accurate angles and surfaces and straight edges.

D. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

F. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

## 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

## 2.7 METAL LADDERS

A. General:
1. For elevator pit ladders, comply with ASME A17.1.

B. Steel Ladders:

1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
3. Rungs: 1-inch- (25-mm-) diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.

## 2.8 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings not less than 8 inches (200 mm) unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

## 2.9 FINISHES, GENERAL

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

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer.

C. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

# PART 3 - EXECUTION

## 3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

## 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

## 3.3 ADJUSTING AND CLEANING

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

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

END OF SECTION 055000

# SECTION 055119 - METAL GRATING STAIRS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Metal grating stairs.
2. Steel railings and guards.

### 1.2 COORDINATION

A. Coordinate installation of anchorages for metal stairs, railings, and guards.

1. 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.

### 1.3 ACTION SUBMITTALS

A. Product Data: For metal grating stairs and the following:

1. Gratings.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

C. Delegated Design Submittal: For stairs, railings, and guards, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Welding certificates.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs, railings, and guards, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360.

C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, 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.

## 2.2 METALS

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

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Bars for Grating Treads: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.

D. Steel Tubing for Railings and Guards: ASTM A500/A500M (cold formed) or ASTM A513/A513M.
   1. Provide galvanized finish for exterior installations and where indicated.

E. Steel Pipe for Railings and Guards: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

F. Provide hot-dipped galvanized finish for exterior installations and where indicated.

G. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

H. General: Provide Type 304 stainless steel fasteners for exterior use.

   1. Select fasteners for type, grade, and class required.

I. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.

J. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

K. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

   1. Provide hot-dip, zinc-coated anchor bolts for exterior stairs.

L. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

   1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless steel bolts, ASTM F593, and nuts, ASTM F594.

## 2.3 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 or ASTM A780/A780M and compatible with paints specified to be used over it.

C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application.

## 2.4 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, , railings, guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs, railings, and guards in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

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 bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish # 3 - Partially dressed weld with spatter removed.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
1. Locate joints where least conspicuous.
2. Fabricate joints that are exposed to weather in a manner to exclude water.
3. Provide weep holes where water may accumulate internally.

## 2.5 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Fabricate stringers of steel channels.

   a. Stringer Size: As required to comply with "Performance Requirements" Article with minimum sizes as indicated on Drawings.
   b. Provide closures for exposed ends of channel stringers.
   c. Finish: Galvanized.

2. Construct platforms and tread supports of steel channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article with minimum sizes as indicated on Drawings.

   a. Provide closures for exposed ends of channel framing.
   b. Finish: Galvanized.

3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers.

C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."

1. Fabricate treads and platforms from welded steel grating with 1-1/2-by-3/16-inch bearing bars at 15/16 inch (24 mm) o.c. and crossbars at 4 inches (100 mm) o.c.

   a. Surface: Serrated.
   b. Finish: Galvanized.

2. Fabricate grating treads with rolled-steel floor plate or cast-abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections.

   a. Secure treads to stringers with bolts.

3. Fabricate grating platforms with nosing matching that on grating treads.

   a. Secure grating to platform framing with bolts.

D. Risers: Open.

## 2.6 FABRICATION OF STAIR RAILINGS AND GUARDS

A. Fabricate railings and guards to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-5/8-inch- diameter top and bottom rails.

2. Intermediate Rails Infill: 1-5/8-inch- diameter intermediate rails spaced less than 21 inches clear.

B. Welded Connections: Fabricate railings and guards with welded connections.

1. Fabricate connections that are exposed to weather in a manner that excludes water.

a. Provide weep holes where water may accumulate internally.

2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
3. Weld all around at connections, including at fittings.
4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
5. Obtain fusion without undercut or overlap.
6. Remove flux immediately.
7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #3 - Partially dressed weld with spatter removed as shown in NAAMM AMP 521.

C. Form changes in direction of railings and guards as follows:
1. By bending or by inserting prefabricated elbow fittings.

D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required.

1. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of railing and guard members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

G. Connect posts to stair framing by direct welding unless otherwise indicated.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.

1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
2. For galvanized railings and guards, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
3. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

## 2.7 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by bolting stair framing to concrete unless otherwise indicated.

1. Grouted Baseplates: Clean concrete bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces.

a. Clean bottom surface of baseplates.
b. Set steel-stair baseplates on wedges, shims, or leveling nuts.
c. After stairs have been positioned and aligned, tighten anchor bolts.
d. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
e. Promptly pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

1) Neatly finish exposed surfaces; protect grout and allow to cure.
2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
3. Comply with requirements for welding in "Fabrication, General" Article.

## 3.3 INSTALLATION OF RAILINGS AND GUARDS

A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.

1. Space posts at spacing indicated or, if not indicated, as required by design loads.
2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.
3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet .
4. Secure posts, rail ends, and guard ends to building construction as follows:

    a. Anchor posts to steel by welding to steel supporting members.
    b. Anchor handrail and guard ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.

B. Attach handrails to wall with wall brackets.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
2. Secure wall brackets to building construction as follows:

    a. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
    b. For hollow masonry anchorage, use toggle bolts.

## 3.4 REPAIR

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055119

# SECTION 076200 - SHEET METAL FLASHING AND TRIM

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Formed low-slope roof sheet metal fabrications.
   2. Formed wall sheet metal fabrications.
   3. Beveled edge guards for projecting ledges in elevator hoistways.

### 1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

### 1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

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

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

### 2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. As-Milled Finish: One-side bright mill.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.

   1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).

## 2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

## 2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
      b. Blind Fasteners: Stainless steel rivets suitable for metal being fastened.

   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
   3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

C. Solder:

   1. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray butyl sealant tape with release-paper backing3/4 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

## 2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:

1. Stainless Steel Seams only: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder welds sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder aluminum sheet.
3. Do not use torches for soldering.
4. Heat surfaces to receive solder, and flow solder into joint.

a. Fill joint completely.
b. Completely remove flux and spatter from exposed surfaces.

5. Stainless Steel Soldering:

a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
b. Promptly remove acid-flux residue from metal after tinning and soldering.
c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

## 3.2 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roofing.

## 3.3 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated.

## 3.4 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:

1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
2. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Beveled edge guards for projecting ledges in elevator hoistways:
1. Provide beveled edge guards sloped at 70 degrees at all projections greater than 4 inches from hoistway walls as required for compliance with ASME A17. Secure to walls.

## 3.5 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

## 3.6 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

## 3.7 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

# SECTION 078100 - APPLIED FIREPROOFING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes sprayed fire-resistive materials (SFRM).

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Fire Resistance Design: From UL or other testing agency acceptable to authorities having jurisdiction, as required to match one-hour rating for existing construction.

### 1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Field Quality-Control Reports: For each type of applied fire protection material.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

### 1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F (7 deg C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Fire-Resistance Design: Provided by Contractor to match existing two-hour rating on structural steel columns and beams, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

C. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction.

D. Asbestos: Provide products containing no detectable asbestos.

### 2.2 SPRAYED FIRE-RESISTIVE MATERIALS

A. SFRM: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application, or conveyed in a dry state and mixed with atomized water at place of application.

1. Bond Strength: Minimum 150-lbf/sq. ft. (7.18-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
2. Density: Not less than 15 lb/cu. ft. (240 kg/cu. m) and as specified in the approved fire-resistance design, according to ASTM E 605.
3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm).
4. Combustion Characteristics: ASTM E 136.
5. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 10 or less.
    b. Smoke-Developed Index: 10 or less.

6. Compressive Strength: Minimum) 100 lbf/sq. in. (689 kPa) according to ASTM E 761.
7. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
8. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
9. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
10. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
11. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.

## 2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.

E. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

1. Cement-Based Topcoat: Factory-mixed, cementitious hard-coat formulation for trowel or spray application over SFRM.

2. Water-Based Permeable Topcoat: Factory-mixed formulation for brush, roller, or spray application over applied SFRM.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:

1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

B. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

## 3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. Clean substrates of substances that could impair bond of fireproofing.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

## 3.3 APPLICATION

A. Construct fireproofing assemblies that provide the fire-resistance rating indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

D. Extend fireproofing in full thickness over entire area of each substrate to be protected.

E. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

F. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.

G. Cure fireproofing according to fireproofing manufacturer's written recommendations.

H. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

## 3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Test and inspect as required by the IBC, Subsection 1705.15, "Sprayed Fire-Resistant Materials."

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

## 3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

# SECTION 078413 - PENETRATION FIRESTOPPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

### 1.2 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. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Fire-resistance-rated walls including two-hour rated fire and smoke barriers at elevator hoistway and equipment room walls.

2. Fire-resistance rated floors and floor/ceiling assemblies. Floors shall have a two-hour rating.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or 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. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

   a. Penetrations located outside wall cavities.
   b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

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.

## 1.3 SUBMITTALS

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

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

C. 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.

## 1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, OPL ITS, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:

a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

1) UL in its "Fire Resistance Directory."
2) OPL in its "Directory of Listed Building Products, Materials, & Assemblies."
3) ITS in its "Directory of Listed Products."

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

## 1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide through-penetration firestop systems that are produced by one of the following manufacturers:

1. Grace, W. R. & Co. - Conn.
2. Hilti, Inc.
3. Johns Manville.
4. Nelson Firestop Products.
5. RectorSeal Corporation (The).
6. Specified Technologies Inc.
7. 3M; Fire Protection Products Division.
8. Tremco; Sealant/Weatherproofing Division.
9. USG Corporation.

### 2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

### 2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

## 2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

## 3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

## 3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

## 3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will inspect through-penetration firestops.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

## 3.6 CLEANING AND PROTECTING

A. Clean off 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 damage materials in which openings occur.

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, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

# SECTION 079200 - JOINT SEALANTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Nonstaining silicone joint sealants.
   2. Urethane joint sealants.

### 1.2 ACTION SUBMITTALS

A. Product Data:

   1. Joint-sealants.
   2. Joint sealant backing materials.

B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

### 1.3 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: Match adjacent surface.

## 2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

## 2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

## 2.4 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330,Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

## 3.4 CLEANING

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

## 3.5 PROTECTION

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

## 3.6 JOINT-SEALANT SCHEDULE

A. Exterior joints in vertical surfaces and horizontal nontraffic surfaces:

a. Control and expansion joints in unit masonry.
b. Joints between metal panels.
c. Perimeter joints between materials listed above and frames of doors, windows ,and louvers.
d. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.

B. Interior joints in vertical surfaces and horizontal nontraffic surfaces:

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors and elevator entrances.

2. Joint Sealant: Urethane, S, NS, 25, NT.

C. Concealed mastics:

1. Joint Locations:

a. Aluminum thresholds.
b. Sill plates.

2. Joint Sealant: Butyl-rubber based.

END OF SECTION 079200

# SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

B. Related Sections:
1. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
2. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

### 1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.

B. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

### 1.3 QUALITY ASSURANCE

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.

## 1.5 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Pioneer Industries, Inc.
5. Steelcraft; an Ingersoll-Rand company.

## 2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum

flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Division 08 Section "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: As indicated.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
   a. Fire Door Core: As required to provide fire-protection ratings indicated.
   b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 47.0 deg F x h x sq. ft./Btu (0.704 K x sq. m/W) when tested according to ASTM C 1363.
      1) Locations: Exterior doors.
3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty). Model 2 (Seamless).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

## 2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded.
3. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded.
3. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

## 2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

## 2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

## 2.7 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

## 2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where

practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.

D. Hollow Metal Frames:

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. .

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
2. Provide loose stops and moldings on inside of hollow metal work.
3. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

## 3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

## 3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Install frames with removable glazing stops located on secure side of opening.
    c. Install door silencers in frames before grouting.
    d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    e. Check plumbness, squareness, and twist of frames. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

## 3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

# SECTION 087100 - DOOR HARDWARE

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for the following:

a. Swinging doors.

### 1.2 SUBMITTALS

A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

### 1.3 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.

1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
2. Installer shall have warehousing facilities in Project's vicinity.
3. Scheduling Responsibility: Preparation of door hardware and keying schedules.

B. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

C. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines ICC/ANSI A117.1 and HUD's "Fair Housing Accessibility Guidelines".

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.
2. Comply with the following maximum opening-force requirements:

a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

## 1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to Owner by registered mail or overnight package service.

## 1.5 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

## 1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which 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 operators 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, except as follows:

   a. Manual Closers: 10 years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in door and frame schedule and as indicated on the drawings.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, products equivalent in function and comparable in quality to named products and products complying with BHMA standard referenced.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:

1. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

## 2.2 HINGES, GENERAL

A. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Hinge Weight: Unless otherwise indicated, provide the following:

1. Entrance Doors: Heavy-weight hinges.
2. Doors with Closers: Antifriction-bearing hinges.
3. Interior Doors: Standard-weight hinges.

D. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin.
2. Interior Hinges: Steel, with steel pin.
3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.

E. Hinge Options: Where indicated in door hardware sets or on Drawings:

1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging corridor doors with locks.
2. Corners: Square.

F. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors and wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

## 2.3 HINGES

A. Butts and Hinges: BHMA A156.1. Listed under Category A in BHMA's "Certified Product Directory."

B. Template Hinge Dimensions: BHMA A156.7.

## 2.4 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 and FED-STD-795, "Uniform Federal Accessibility Standards."

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.

B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Lock Trim: Levers.

D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Bored Locks: Minimum 1/2-inch latchbolt throw.

E. Backset: 2-3/4 inches, unless otherwise indicated or required for existing doors.

F. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:

1. Strikes for Bored Locks and Latches: BHMA A156.2.

## 2.5 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:

1. Bored Locks: BHMA A156.2.

B. Bored Locks: BHMA A156.2, Grade 1 unless Grade 2 is indicated; Series 4000. Listed under Category F in BHMA's "Certified Product Directory."

## 2.6 DOOR BOLTS

A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Half-Round Surface Bolts: Minimum 7/8-inch throw.
2. Mortise Flush Bolts: Minimum 3/4-inch throw.

B. Dustproof Strikes: BHMA A156.16, Grade 1.

C. Manual Flush Bolts: BHMA A156.16, Grade 1; designed for mortising into door edge.

D. Automatic and Self-Latching Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.

## 2.7 LOCK CYLINDERS

A. Standard Lock Cylinders: BHMA A156.5, Grade 1, compatible with the existing building keying system.Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Six or Seven.
2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.

## 2.8 OPERATING TRIM

A. Standard: BHMA A156.6 and as illustrated on Drawings.

B. Materials: Fabricate from stainless steel, unless otherwise indicated.

## 2.9 CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1 and FED-STD-795, "Uniform Federal Accessibility Standards."

1. Comply with the following maximum opening-force requirements:

a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

C. Surface Closers: 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 recommendations 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.

D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations 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.

E. Surface Closers: BHMA A156.4, Grade 1. Listed under Category C in BHMA's "Certified Product Directory." Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

## 2.10 PROTECTIVE TRIM UNITS

A. Size: 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in door hardware sets.

B. Fasteners: Manufacturer's standard machine or self-tapping screws.

C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:

1. Material: 0.050-inch- thick stainless steel.

## 2.11 STOPS

A. Stops and Bumpers: BHMA A156.16, Grade 1 unless Grade 2 is indicated.

## 2.12 DOOR GASKETING

A. Standard: BHMA A156.22. Listed under Category J in BHMA's "Certified Product Directory."

B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

C. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.

D. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

E. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

## 2.13 THRESHOLDS

A. Standard: BHMA A156.21. Listed under Category J in BHMA's "Certified Product Directory."

B. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch high.

## 2.14 MISCELLANEOUS DOOR HARDWARE

A. Auxiliary Hardware: BHMA A156.16, Grade 1.

## 2.15 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal, 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 BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except 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. Steel Machine or Wood Screws: For the following fire-rated applications:

   a. Mortise hinges to doors.
   b. Strike plates to frames.
   c. Closers to doors and frames.

3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:

   a. Surface hinges to doors.
   b. Closers to doors and frames.
   c. Surface-mounted exit devices.

4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

## 2.16 FINISHES

A. Standard: BHMA A156.18, as indicated in door hardware sets.

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

### 3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 Series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

### 3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated on Drawings as follows unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

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 specified in Division 09 Sections. 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 according to industry standards.

C. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

D. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

## 3.4 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.

## 3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

## 3.6 DOOR HARDWARE SETS

HW – 1

Door Pair:

| | | |
|---|---|---|
| 3 | PAIR HINGES | A8112 x 630 x NRP |
| 1 | LOCKSET | F86 |
| 2 | CLOSERS | C02061 |
| 1 | WALL STOP | L01371 |
| 1 | SET AUTO-LATCHING FLUSHBOLTS (inactive leaf) | L14251 |
| 1 | THRESHOLD | J36130 |
| 1 | KICKPLATE | J102 x 630 |

HW - 2

Single Door:

| | | |
|---|---|---|
| 1 1/2 | PAIR HINGES | A5112 x 630 x NRP |
| 1 | LOCKSET | F86 |
| 1 | CLOSER | C02021 |
| 1 | KICKPLATE | J102 x 630 |
| 1 | THRESHOLD | J36190 |
| 1 | SET WEATHERSTRIPPING | PEMKO 316AV |
| 1 | OVERHEAD DRIP | PEMKO 346 |
| 1 | DOOR BOTTOM | PEMKO 345 |

END OF SECTION 087100

# SECTION 088000 - GLAZING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Doors.

### 1.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

### 1.4 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing labeling is indicated or required by code, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

## PART 2 - PRODUCTS

### 2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

## 2.2 GLASS PRODUCTS

A. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.

## 2.3 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of 3.0 mm thick tempered safety glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
2. Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

## 2.4 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
3. Silicone complying with ASTM C 1115.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

## 2.5 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

## 2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Grind smooth and polish exposed glass edges and corners.

# PART 3 - EXECUTION

## 3.1 PREPARATION

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

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

## 3.2 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or

other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

## 3.3 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass.

D. Install gaskets so they protrude past face of glazing stops.

## 3.4 CLEANING AND PROTECTION

A. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

# SECTION 092920 - GYPSUM BOARD ASSEMBLIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Steel framing.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

### 1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

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

### 2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: As indicated.
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

B. Cement Board: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

C. Gypsum Liner Panels: Comply with ASTM C 442/C 442M.

1. Moisture- and Mold-Resistant Type X: Manufacturer's proprietary liner panels with moisture- and mold-resistant core and surfaces; comply with ASTM D 3273.

a. Core: 1 inch (25.4 mm) thick.
b. Long Edges: Double bevel.

## 2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:
   a. LC-Bead: J-shaped; exposed long flange receives joint compound.

## 2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.

## 2.6 NON-LOAD BEARING STEEL FRAMING

A. Framing Members: Comply with ASTM C 754 for conditions indicated.

B. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.

1. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

## 2.7 COLD-FORMED STEEL FRAMING

A. Floor Joist Framing Members: Comply with AISI S240 for conditions indicated.

B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: ST33H (ST230H).
   Coating: G60 (Z180).

## 2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to wood or steel members. from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

# PART 3 - EXECUTION

## 3.1 INSTALLATION OF FRAMING

A. Install steel framing in accordance with manufacturer's written instructions unless more stringent requirements are indicated.

B. Install framing and securely anchor to supporting structure. Install framing and accessories plumb, square, and true to line, and with connections securely fastened.

## 3.2 EXAMINATION

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.3 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

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

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
   1. Fit gypsum panels around ducts, pipes, and conduits.

E. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

## 3.4 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

   1. Type X: Provide for all horizontal and vertical surfaces unless otherwise indicated.

B. Single-Layer Application:

   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

   2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

   1. Apply gypsum board at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel existing base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   2. Fastening Methods: Fasten face layers through existing base layer to supports with screws.

## 3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Interior Trim: Install in the following locations:

1. LC-Bead: Use at exposed panel edges at perimeter of ceiling abutting masonry wall.

## 3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

## 3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092920

# SECTION 096519 - RESILIENT TILE FLOORING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Solid luxury vinyl floor planks installed in elevator car floors.

### 1.2 SUBMITTALS

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

B. Samples for Verification: Full-size units of each color and pattern of floor tile required.

C. Manufacturer's Warranty: For each type of floor tile.

### 1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

### 1.5 PROJECT CONDITIONS

A. Close spaces to traffic during floor tile installation.

B. Close spaces to traffic for 48 hours after floor tile installation.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Slip Resistance: exceeds 0.50 per ASTM D 2047 test method.

C. Residual Indentation: average less than 8% per ASTM F 1914 test method.

D. Heat Stability: passes ASTM F 1514 test method.

E. Light Stability: passes ASTM F 15154 test method.

F. Chemical Resistance: passes ASTM F 925 test method.

## 2.2 SOLID LUXURY VINYL FLOOR TILE (LVT) PLANKS

A. Product Description: A layered construction consisting of a tough, clear, vinyl wear layer protecting a high-fidelity print layer on a solid vinyl backing. Protected by a UV-cured polyurethane finish, the wear surface is embossed with different textures to enhance each of the printed visuals. Colors shall be insoluble in water and resistant to cleaning agents and light. Product shall be a non-ortho phthalate and shall be manufactured in the United States.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Flexco Floors; “Natural Elements Plank” or comparable product by one of the following:

1. Armstrong Flooring; Natural Creations “ArborArt”.

C. Tile Standard: ASTM F 1700, Class III, Type B-embossed surface.

D. Hardness: Manufacturer's standard hardness.

E. Thickness: 0.125 inches.

F. Wear-Layer Thickness: 0.020 inches minimum.

G. Finish: UV-cured polyurethane.

H. Size: 4 by 36 inches or 6 by 48 inches.

I. Seaming Method: Standard.

J. Colors and Patterns: As selected by Owner from manufacturer’s available selections.

K. Warranty: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period of a minimum 10 years commercial use.

## 2.3 INSTALLATION MATERIALS

A. Adhesives: Type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

### 3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Do not install floor tiles until they are same temperature as space where they are to be installed.

### 3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile in elevator car floors.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

C. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### 3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096519

# SECTION 099113 - EXTERIOR PAINTING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes surface preparation and the application of paint and stain systems on the following exterior substrates:

1. Steel.

### 1.2 SUBMITTALS

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

B. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

### 1.3 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

### 1.5 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 PAINT, GENERAL

A. Material Compatibility:

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

B. Colors: As selected by Owner.

### 2.2 WATER-BASED PAINTS

A. Light Industrial Coating, Water Based (Semi-gloss): MPI #163 (Gloss Level 5).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

### 3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that 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.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

## 3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

## 3.4 CLEANING AND PROTECTION

A. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

B. 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.

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

## 3.5 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates, including exterior doors and frames:

1. Water-Based Light Industrial Coating System: MPI EXT 5.1C-G5.

a. Spot Prime Coat: Alkyd anti-corrosive primer, MPI #79.
b. Intermediate Coat: Water-borne light industrial coating matching topcoat.
c. Topcoat: Water-borne light industrial coating (semi-gloss), MPI #163.

END OF SECTION 099113

# SECTION 099123 - INTERIOR PAINTING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
   1. Concrete.
   2. Concrete masonry.
   3. Steel.
   4. Plywood.
   5. Gypsum board.

### 1.3 SUBMITTALS

   1. Product Data: For each type of product indicated including printed statement of VOC content and chemical components.

B. Product List: For each product indicated, include the following:

   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

### 1.4 QUALITY ASSURANCE

A. MPI Standards:

   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
   2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

## 1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. Duron, Inc.
3. ICI Paints.
4. M.A.B. Paints.
5. PPG Architectural Finishes, Inc.
6. Sherwin-Williams Company (The).

## 2.2 PAINT, GENERAL

A. Material Compatibility:

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

B. Colors: As selected by owner.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete and concrete masonry: 12 percent.
2. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

## 3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that 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.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. Plywood Substrates:
1. Prime edges, ends, faces, undersides, and backsides of plywood.

G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

## 3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Pipe hangers and supports.

## 3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

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

## 3.5 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:

1. High-Performance Architectural Latex System: MPI INT 3.1C.

a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
b. Topcoat: Latex, interior, high-performance architectural, (MPI Gloss Level G3), MPI #139.

B. Concrete Substrates, Horizontal (Traffic) Surface in elevator pits and equipment rooms.

1. Epoxy System: MPI INT 3.2C.

a. Prime Coat: Epoxy, matching topcoat.
b. Intermediate Coat: Epoxy, matching topcoat.

c. Topcoat: Epoxy, semigloss (MPI Gloss Level G5), MPI #177.

C. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.

a. Prime Coat: Rust-inhibitive primer (water based), MPI #107.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex (semigloss), MPI #147.

D. Plywood Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 6.3V.

a. Prime Coat: Interior latex-based wood primer, MPI #39.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex (semigloss), MPI #147.

E. Concrete Masonry Substrates:

1. High-Performance Architectural Latex System: MPI INT 3.1C.
a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
b. Topcoat: Latex, interior, high-performance architectural, (MPI Gloss Level G3), MPI #139.

F. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M. Provide for walls and ceilings unless indicated otherwise.

a. Prime Coat: Interior latex primer/sealer institutional low odor/VOC, MPI #149.
b. Topcoat: Institutional low-odor/VOC interior latex (low sheen). (Gloss Level 3), MPI #145.

END OF SECTION 099123

# SECTION 101400 - SIGNAGE

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes the following:

1. Panel signs for elevator equipment room identification.
2. Code-required elevator signage and markings per ADA and ASME A17.1.

### 1.2 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

### 1.3 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for signs.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available.

D. Sign Schedule: Use same room numbers and room designations indicated on Drawings.

### 1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. .

C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1. Provide elevator signage to comply with ASME A17.

## 1.5 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. Aluminum: Extruded Aluminum Alloy 6063, ASTM B221. ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

B. Photopolymer: Etched photopolymer panels inserted in aluminum frames.

## 2.2 PANEL SIGNS

A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles. Provide signs to match the existing room identification signage in each building and as follows:

1. Frame:

   a. Material: Aluminum
   b. Material Thickness: Per manufacturer's standard.
   c. Frame Depth: Per manufacturer's standard.
   d. Profile: Flat.
   e. End caps: Aluminum.
   f. Finish and Color: As selected by Architect from manufacturer's full range.

2. Mounting: Painted steel bracket.

3. Surface Finish and Applied Graphics:

   a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
   b. Integral Photopolymer Sheet Color: As selected by Architect from full range of industry colors.
   c. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard in color as selected by Architect from manufacturer's full range.

4. Text and Typeface: Helvetica Medium accessible raised characters and Braille. Finish raised characters to contract with background color, and finish Braille to match background color.

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner. Provide signs to match the existing room identification signage in each building. Comply with the following requirements:

1. Acrylic Sheet: 0.080 inch thick.

2. Laminated, Etched Photopolymer: Raised graphics with Braille 1/32 inch above surface with contrasting colors as selected by Owner from manufacturer's full range and laminated to acrylic back.
3. Edge Condition: Square cut.
4. Corner Condition: Rounded to radius indicated.
5. Mounting: Framed Unframed As indicated.

    a. Wall mounted with two-face tape.

6. Custom Paint Colors: Match Pantone color matching system.
7. Color: As selected by Owner from manufacturer's full range.
8. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors.

C. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

1. Panel Material: Opaque acrylic sheet Photopolymer Clear acrylic sheet with opaque color coating, subsurface applied.
2. Raised-Copy Thickness: Not less than 1/32 inch.

D. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth.

1. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.
2. Engraved Metal: Fill engraved copy with enamel.
3. Engraved Opaque Acrylic Sheet: Fill engraved copy with enamel.
4. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with enamel. Apply opaque background color coating to back face of acrylic sheet.

## 2.3 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

## 2.4 FINISHES, GENERAL

A. 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

### 3.1 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
3. Coordinate final location with Owner.

B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls according to accessibility standard.

C. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Shim Plate Mounting: Provide 1/8-inch- thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
2. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

### 3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101400

# SECTION 14 21 23.13 MACHINE ROOM ELECTRIC TRACTION PASSENGER ELEVATOR

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This specification outlines the scope of the work required and provides general information about the existing installation. It is not intended to exempt the successful bidder from making detailed inspections to determine existing conditions prior to submitting a bid for this work. Failure to perform an onsite inspection or performance of an inadequate inspection will not relieve the successful bidder from full compliance with these specifications. Provide round 1.5” handrails with end that return to walls on side walls and rear of elevator. Compliance with all provisions of Contract Documents is assumed and required. Purchaser will not pay for change to building structure, structural supports, mechanical, electrical or other systems required to accommodate Provider’s equipment if not identified before Contract award. The contractor shall provide the necessary equipment for a complete installation of the traction passenger elevators in full compliance with ASME A17.1 and related codes and standards, including the providing of all labor, tools, appliances, materials, equipment, transportation and construction work of every kind required and incidental to the alteration of elevators #1, #2, #3, and #4, complete and ready for continuous satisfactory operation.

Basis of design for elevators 1, 2, and 3 is ASME A17.1 – 2022 edition with Imperial gearless machines, MCE controls with VVVF drives, GAL MOVFR-II door operators, Quick Cabs interiors, Innovation fixtures. Basis of design for elevator 4 is ASME A17.1 – 2022 with a Hollister-Whitney basement geared machine, MCE controls with VVVF drive, GAL MOVFR-II door operators, Quick Cab interiors, and Innovation fixtures. The items to be retained will be addressed later in this Section.

Work of this section include providing equipment, incidental material, transportation, all permits, all taxes, and all labor required for a complete and operable elevator installation and all related maintenance of the newly installed equipment. Where singular reference is made to elevators or elevator components, such reference shall apply to the number of elevators or components required to complete the installation. This specification provides a broad outline of required equipment and does not describe the details of design and construction. Details shall be included in shop drawings required to be submitted in this section. Elevators shall be erected, installed, adjusted, tested and place in operation by qualified elevator installers. In order to provide continuity of service and maintenance, certain products and manufacturers have been specified and substitutions will not be allowed without prior, written approval.

This Section includes the following:

| | |
|---|---|
| 1. Scope of Work: | Alterations to three (3) gearless traction passenger elevators, elevators 1, 2, and 3, as specified herein and alterations to one (1) geared basement traction passenger elevator, elevator 4. Contractor to identify and remove all elevator items in the shaft and machine room which are abandoned or superseded by new work provided in this Contract. |
| 2. Type of Machine: | Remove and legally dispose of existing machines and motors. Provide new machines with motors and emergency rope brakes with all required associated mounting members, located in existing machine rooms. Elevators 1-3 are overhead gearless machines with machine room is located above hoistway as shown on drawings. Elevator 4 is a basement geared machine located below hoistway as shown on drawings. |
| 3. Load (Capacity): | Elevators 1, 2, 3: 2100 pounds<br>Elevator 4: 4000 |
| 4. Car Speed: | Elevators 1, 2, 3: 500 feet per minute<br>Elevator 4: 200 feet per minute |
| 5. Operation: | Selective collective automatic |
| 6. Control: | Remove and legally dispose of existing controls. Provide microprocessor controllers with solid state starting and absolute encoder landing control systems, independent service, and access switches. Provisions for emergency power and card readers shall be included. |
| 7. Rise: | Elevators 1, 2, 3: Existing 87’ – 0”<br>Elevator 4: Existing 74’ – 8” |
| 8. Number of Stops: | Elevators 1, 2, 3: 9 stops (floors B, 1, 2, 3, 4, 5, 6, 7, 8)<br>Elevator 4: 9 stops (floors 1, LD, 2, 3, 4, 5, 6, 7, 8) |
| 9. No. of Openings: | Elevators 1, 2, 3: 9 openings (Front Only)<br>Elevator 4: 9 openings (8 Front, 1 Rear) |
| 10. Maintenance: | Begin upon contract start. New Installation Service (NIS) to begin upon final acceptance of last elevators and continue for twelve (12) months |
| 11. Power Supply: | 208 volts, 3 phase, 60 hertz |
| 12. Lighting Supply: | 120 volts, 1 phase, 60 hertz |

| | |
|---|---|
| 13. Car Enclosure: | Elevators 1, 2, 3: Provide new cab interior. Retain shell. See AD. ENCLOSURE for details for elevator cab. |
| | Elevator 4: Provide new cab shell and interior. See AD. ENCLOSURE for details for elevator cab |
| 14. Platform Size: | Existing |
| 15. Height Under Top: | Elevators 1, 2, 3: 8' – 0" finished floor to underside of car top with down lighting in suspended ceiling below |
| | Elevator4: 7' – 10" finished floor to underside of car top with down lighting in suspended ceiling below |
| 16. Entrance Size: | Elevators 1, 2, 3: 3' – 6" wide x 7' – 0" high |
| | Elevator 4: 4' – 0" wide x 7' – 0" high |
| 17. Entrance Type: | Center Opening |
| 18. Door Opening Size: | Elevators 1, 2, 3: Existing 3' – 6" wide by 7' – 0" high |
| | Elevators 4: Existing 4' – 0" wide by 7' – 0" high |
| 19. Hoistway Doors: | Elevators 1, 2, 3: Provide new |
| | Elevator 4: Retain existing |
| 20. Hoistway Door Sills: | Retain existing |
| 21. Hoistway Door Frames: | Retain Existing |
| 22. Hoistway Clear Size: | Elevators 1, 2, 3: Existing 8' – 3" clear width by 6' – 2" clear depth each elevator |
| | Elevator 4: Existing 8' – 7" clear width by 8' – 10" clear depth |
| 23. Pit Depth: | Elevators 1, 2, 3: Existing 10' – 8" |
| | Elevator 4: Existing 13' – 4" |
| 24. Overhead: | Elevators 1, 2, 3: Existing 19' – 7" |
| | Elevator 4: Existing 15' – 2" |
| 25. Braille Plates: | Provide new Braille plates at each floor on both jambs at ADA heights. Braille plates to be securely fastened to jambs |
| 26. Car Doors: | Provide new |
| 27. Car Door Sill: | Provide new |
| 28. Car Door Operator: | Remove and legally dispose of existing and provide new heavy-duty harmonic door operators |

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| 29. Door Restrictor: | Provide new. Restrictors shall operate in conjunction with collapsable angles mounted to car doors and angles on fascia |
| 30. Door Protection: | Provide new infrared door reversal devices |
| 31. Governor: | Elevators 1, 2, 3: Provide new governors with bi-directional switches, tension sheaves, and ropes |
| | Elevator 4: Provide new pit mounted governor with bi-directional switches, tension sheave, and rope |
| 32. Safeties: | Provide new type B safeties |
| 33. Guide Rails: | Retain existing. See K. GUIDE RAILS for details |
| 34. Roller Guides: | Provide new roller guides for cars and counterweights. See L. ROLLER GUIDES for details |
| 35. Buffers: | Elevators 1, 2, 3: Provide new oil buffers |
| | Elevator 4: Retain existing spring buffers. Clean and paint. |
| 36. Counterweights: | Elevators 1, 2, 3: Retain frames and filler weights. Provide new additional filler weights for balancing, counterweight guards, and sheaves with sealed bearings |
| | Elevator 4: Retain existing. Provide additional filler weights required for balancing |
| 37. Slings and Platforms: | Retain existing |
| 38. Cab Flooring: | Provide new. Cab flooring covering shall be as selected by A/E. Car sill shall be flush with finished flooring surface. Verify finished flooring height before ordering car sill. See architectural finishes for details |
| 39. Top of Car Station: | Remove and legally dispose of existing. Provide new. |
| 40. Fixture Finishes: | Provide new 304 stainless-steel finishes |
| 41. Car Fixtures: | Remove and legally dispose of existing. Provide car operating panels and car fixtures. (Mechanical, illuminating, vandal-resistant push buttons with positive metal stop, integral position/direction indicator and Braille, LED emergency car lights, ADA-type “hands-free” phone). Provide code required emergency communication devices (see 2.3 R COMMUNICATION AND INTERCOM SYSTEM for more details). Exposed key switches shall be of heavy-duty design; exposed plastic collars on key switches are not acceptable. |
| | Elevators 1, 2, 3: Provide main and auxiliary panels |

| | |
|---|---|
| | Elevator 4: Provide main panel |
| 42. Hall Fixtures: | Remove and legally dispose of existing. Provide call registration buttons (mechanical, illuminating, vandal-resistant push buttons with positive metal stop) in new hall fixtures. Provide stainless pictograph (exit signage) for all floors above hall button fixtures. Provide stainless-steel engraved car identification numerals at each landing. Provide access key switches at top and bottom landings. Provide flush mounted, illuminating lanterns with position indicators at each landing, above or adjacent to each entrance. Provide emergency communications failure notification with buzzer and key switch to silence alarm at designated landings. Provide first floor Emergency Power and Firefighters' Service devices/instructions integral with first floor hall station fixture. Provide hall position indicators at each landing. Exposed key switches shall be of heavy-duty design; exposed plastic collars on key switches are not acceptable. |
| | Elevators 1, 2, 3: Provide hall call stations between elevators 1 and 2 and between elevators 2 and 3 at each landing |
| 43. Drawings: | See Drawings |
| 44. Pit Equipment: | Remove and legally dispose of existing equipment not retained in alterations. Clean, sand, and paint all pit equipment |

B. Preparatory work included in this Section

1. Contractor shall submit proposed equipment and machine room heat release data for approval within six weeks of notice of contract award.

2. Contractor shall ensure that holes in the machine room floor for the passage of ropes, cables, or other moving elevator equipment are limited in size so as not to provide greater than 2 inches of clearance on all sides. Any slab penetrations not reused shall be sealed.

3. Where hoistway walls or floors are penetrated by elevator fixture boxes, the hoistway wall penetrations are to be designed and constructed to provide protection and maintain the fire-resistive integrity of the hoistway walls. Provide drawings and general notes for work, if required, for cutting and patching for new signal fixtures. Surface mounted hall fixtures are not permitted.

4. Provide all wiring and signal fixtures. Install fixtures as indicated elsewhere in this section and on drawings. Provide elevator corridor call station pictograph above hall push button fixtures.

5. Submit power confirmation form for approval with details of current characteristics before beginning work. Main line power supply is 208 volts, 3 phase, 60 hertz.

6. Provide necessary wiring between isolation transformer/choke and elevator controller VVVF drive in machine room. Submit power confirmation form for approval with details of current characteristics before beginning work.

7. Products furnished but not installed under this Section include work in the elevator machine room, pits, hoistway and corridors which are to be performed and it shall be the responsibility of the Contractor to provide and coordinate all work with other trades to complete the work. The Contractor shall perform all miscellaneous work, and provide wire and appurtenances required to complete the work.

8. Submit detailed shop drawings for approval of fixtures and any cutting, including cutouts to accommodate specified fixtures in locations approved by the elevator consultant. Submit fully dimensioned layout in accordance with A17.1 requirements.

9. Submit detailed shop drawings for approval of new cab to be approved.

10. Remove old signal fixtures and all wiring. Install new fixtures as indicated elsewhere in this section. Faceplate for fixtures shall be satin finished stainless steel. At designated landing provide Firefighters' Service devices, Phase I instructions, elevator communications failure devices, emergency power jewel, and required engraving in hall button fixture faceplate.

11. Provide necessary wiring and conduits between feeder, new disconnect, car light disconnect, and new controller in machine room.

12. Contractor to identify and remove all elevator items in the shaft and machine room which are abandoned or superseded by new work provided in this Contract.

13. Floor level 1 shall be the designated landing for Phase 1 operation. Floor level 2 shall be the alternate landing.

14. Products furnished but not installed under this Section include work in the elevator machine room, pit, hoistway and corridors and are specified in other sections and it shall be the responsibility of the Contractor to coordinate all work with other trades to complete the work.

    Items below are performed by other trades but are included in this contract: including, but not limited to Main line power disconnect, Car light disconnect, GFCI pit and machine room receptacles, machine room, hoistway and pit lighting and additional as follows:

    a. Provide and install lighting fixtures (pit lights) and associated brackets 4' above elevator pit floor.

b. Provide and install light switches and associated wiring adjacent to pit ladder.
c. Provide and install conduit, associated wiring and GFCI protected receptacles 4’ above elevator pit floor.
d. Provide and install conduit and GFCI receptacles for sump pump.
e. Provide and install lighting fixtures (machine room lights) and appurtenances in machine room. Lighting to be located to maintain minimum 7’-0” clear headroom.
f. Provide and install light switch and associated wiring adjacent for machine room lights on strike jamb side of machine room door.
g. Provide and install hoistway lighting fixtures and appurtenances throughout each elevator hoistway.
h. Provide and install conduit, associated wiring and GFCI protected receptacles in machine room.
i. Provide and install fused disconnect switches with earth ground for elevators in machine room.
j. Provide and install shunt trip devices as required
k. Provide and install 30A fused disconnect switches for elevator car lighting in machine room.
l. Enclose and protect machine room to maintain fire rating and seal for HVAC efficiency. Remove or relocate all non-elevator related equipment from machine room. Elevator machine rooms to have 7’ – 0” minimum clear height throughout machine rooms.
m. Provide machine room lighting that provides a minimum of 19 fc in all areas of the machine rooms
n. Install bevel guards at 75° on all recesses, projections or setbacks over 4” except on entrance sills.
o. For elevators 1, 2 and 3: Provide a vertical ladder of non-combustible material extending 48" minimum above sill of access door with required switches.
p. Machine room temperature to be maintained between 70º and 90º F and not to exceed 60% relative humidity, non-condensing at all times and in all weather conditions. HVAC design to include BTU heat load generated by operation of elevator equipment. HVAC not to be within 18” of any elevator drive machine or any mechanical or electrical equipment. AC condensate to drain to location outside machine room and hoistway. Elevator related HVAC equipment to be powered on emergency/standby power when elevator is on emergency/standby power.
q. Fill and grout around entrances, as required.
r. Provide recesses, supports, fireproofing and patching, as required, to accommodate hall button boxes, signal fixtures, hoistway entrance frames, etc.
s. Provide supports for vertical wireways
t. Provide repairs, fireproofing and patching, as required for hoistway enclosures and machine room enclosures.
u. Provide interface of elevators to building fire alarm system and emergency power system including signals to elevator system for emergency power activation and pre-signal when returning to normal power.
v. Provide permanent provisions to prevent accumulation of water including

pit sump pump with wiring, piping, and oil sensors as required. Sump pits, if provided, shall have removable gratings that are flush with the finished pit floor.

w. Provide fire alarm initiating devices in the elevator lobbies, pit, hoistway, and machine room including wiring to the terminals of the elevator controllers for firefighters' service recall
x. Mount Fire alarm FEO operation modules inside the elevator control room
y. For elevator machine room and hoistway sprinklers located more than 2 feet above the pit floor, provide a supervised shut-off valve, check valve, flow switch, and test valve in the dedicated sprinkler line feeding the elevator machine room and/or hoistway. Locate these items outside of and adjacent to the control room and/or hoistway. Actuation of the flow switch must remove power to the elevator by shunt trip breaker operation. Shunt trip actuation must be instantaneous; the flow switch must not have time delay capability.
z. Provide connection to shunt trip devices for each elevator main power and emergency power
aa. Provide heat detectors or sprinkler line flow control switches required to activate shunt trip
bb. Provide dedicated receptacle adjacent to elevator controller for cellular gateway battery backup for emergency communications system.
cc. Provide a means for equipment removal purposes in the machine rooms
dd. Provide supports for machinery and/or sheave beams.
ee. Remove or relocate all non-elevator related pipes, ducts, and conduit from hoistways and machine rooms.
ff. Provide hoistway pit lighting that provides a minimum of 10 fc at the pit floor in all areas of the pit. Hoistway lighting design must include a minimum of two lighting fixtures for lighting of each elevator hoistway pit. The lighting switch must be located adjacent to the hoistway pit access ladder.
gg. Provide a dedicated earth ground for elevator controls
hh. Provide a separate branch circuit supplying the hoistway pit lighting and a minimum of one duplex GFCI receptacles in each pit.
ii. Provide NEMA Type 4 electrical enclosures per NEMA ICS6 for all electrical equipment located less than 4 feet above the pit floor. Electrical enclosures must be water-tight, dust-tight, and identified for use in wet locations in accordance with the requirements in NFPA 70
jj. Provide a telephone line or cellular gateway to provide for the visual monitoring system and means within the car for communications with or signaling to an accessible point outside the hoistway, or central exchange system, or an approved emergency service.
kk. Provide conduit to remote locations for elevator communications and alarm systems
ll. Provide guarding and protecting hoistway during construction
mm. Protect installed construction
nn. Provide Metal Fabrications for pit ladders and connections
oo. Provide labor and materials for all required Elevator Inspections
pp. For each of the following circuits, provide a separate, dedicated branch circuit with a fused disconnect or breaker. Disconnects and breakers must

be designed to be lockable in the open position only.

1) Elevator 120 VAC circuit for elevator cab lighting and receptacles.
2) Elevator hoistway pit sump pump power and control system.
3) Pit lighting
4) Hoistway lighting
5) Machine room lighting
6) Pit GFCI receptacles
7) Machine Room GFCI receptacles
8) Machine Room Heating and Cooling system

C. Contractor shall employ a licensed structural engineer to review and certify that the existing structure can accommodate the new equipment proposed by the Contractor. This includes checking the loads and alterations to the existing structure, checking reactions for the proposed machine and the addition of an emergency brake. Contractor shall submit layout showing reactions for proposed elevators. Follow ASME requirements for data shown on layout. The Contractor shall make and pay for all changes and remove and dispose of existing equipment being replaced.

D. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

E. Products previously installed but not furnished under this Section include retained equipment that shall be refurbished (see PART 2 descriptions for item refurbishing requirements) and maintained in like new condition. The following shall be retained. However, the successful Contractor has the option to provide similar new equipment, subject to Purchaser approval, if it is more cost effective:

1. Car rails
2. Counterweight rails
3. Hoistway door frames
4. Hoistway door sills and sill supports
5. Car slings and platforms
6. Elevators 1, 2, and 3 cab shells
7. Elevator 4 car and counterweight buffers
8. Elevator 4 hoistway doors

F. Low-Emitting Materials: Adhesives, sealants, paints and coatings applied within the building envelop and all composite wood and laminating adhesives (applied on and off site) shall comply with Federal standards for “Indoor Air Quality Management.”

1.2 APPLICABILITY / TERMS / DEFINITIONS

A. A descriptive paragraph indicates new equipment that applies to the elevator.

B. The requirements of this division apply to the elevator unless otherwise explicitly noted for each individual elevator.

C. “Project Manager”, if any, shall be the firm designated by the Purchaser.

D. “Architect”, “Engineer” or “A/E” shall be the firm designated by the Purchaser.

E. "Consultant" in this SECTION shall mean the firm be the firm designated by the Purchaser.

F. "Contractor" shall mean the person, firm or corporation named in the Contract Documents who will execute the Work. It shall include all his employees, subcontractors and suppliers.

G. "Provide" shall mean to furnish, supply new, install and connect up, complete and ready for safe and regular operation, the particular work referred to unless specifically indicated otherwise.

H. "Install" shall mean to erect, mount and connect complete with related accessories.

I. "Furnish" or "Supply" shall mean to purchase, procure, acquire and deliver complete with related accessories.

J. "Notice to Proceed" shall mean a written document from the Purchaser allowing the Contractor to commence only that portion of the Work stated in the written document.

K. "Work" shall mean the services, materials, labor and all other equipment required for complete and proper installation by the Contractor.

L. "Best", "first-class" or similar terms as applied to materials, products and workmanship shall mean that, in the Architect's opinion, there are no superior qualities of materials or products on the market, and there is no better class of workmanship.

M. "Concealed" shall mean in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.

N. "Exposed" shall mean not installed underground or "concealed" as defined above.

O. "Indicated," "shown," or "noted": as indicated, shown, or noted on drawings or as specified.

P. "Similar," or "equal": of base bid manufacturer, equal in materials, weight, size, design, and efficiency of specified product, conforming with "Acceptable manufacturers".

1.3 REFERENCES

A. Codes and Standards: Except as modified by governing codes and by this Division, the work shall comply with provisions of the applicable editions of the following, in the event of conflict between these standards, the Architect's/Consultant's determination shall be final:

1. International Building Code (IBC)
2. National Fire Protection Association (NFPA 1) Fire Code
3. National Fire Protection Association (NFPA 101) Life Safety Code
4. National Fire Protection Association (NFPA 13) Automatic Sprinkler Systems
5. National Fire Protection Association (NFPA 70) National Electrical Code
6. National Fire Protection Association (NFPA 72) National Fire Alarm and Signaling Code

7. National Fire Protection Association (NFPA 92) Standard for Smoke Control Systems
8. American Society of Mechanical Engineers (ASME A17.1) Safety Code for Elevators and Escalators – 2022 edition
9. Americans with Disabilities Act (ADA) Standards for Accessible Design
10. National Elevator Industry, Inc. (NEII-1)

B. In the event a later version of a code is adopted at the time of permit application, the Elevator Contractor shall comply with the later code edition at no extra cost.

C. All electrical and other apparatus furnished under this Contract shall be approved by UL or other approved testing agency and shall be so labeled or listed where such is applicable. Where custom-built equipment is specified and the UL label or listing is not applicable to the completed product, all components used in the construction of such equipment shall be labeled or listed by UL where applicable.

1.4 SYSTEM DESCRIPTION

A. Design Requirements: Remove and legally dispose of existing elevator equipment not reused in the new installation. Provide new passenger traction elevators including microprocessor control without regenerative drives. If regenerative drives are provided, a means shall be provided for removing regenerated power from the drive power supply during dynamic braking. This power shall be dissipated in a resistor bank, which is an integral part of the controller. Failure of the system to remove the regenerated power shall cause the drive output to be removed from the hoist motor. Provide absolute encoder-type landing control systems, VVVF drives, AC motor for machines, hoist ropes, governors, hoistway switches, top and bottom access switches, interlocks, operating devices, car and hall signal fixtures as specified using 2:1 gearless machines with emergency rope brakes for elevators 1, 2,3 and using 1:1 geared basement machine for elevator 4 including all wiring starting at elevator disconnects. Provide all new wiring including new hoistway switches, interlocks, operating devices, car and hall signal fixtures as specified. Provide new hoistway and cab doors for elevators 1, 2, 3. Provide new cab doors for elevator 4. Provide new hoistway and pit equipment, including but not limited to buffers, supports and channels for elevator 1, 2,3. Retain elevator 4 pit equipment. Retain car slings and platforms. Retain existing entrance frames. Provide hardware for the new hoistway door panels including new tracks, air cord drives, hanger rollers, guides and retainers. Provide door restrictors, stainless steel car doors and all hardware including new door operators. Provide cabs interiors as specified. Provide new infrared door reversal devices. Provide complete installation of the electric passenger elevators in full compliance with ASME A17.1 and related codes and standards, including the providing of all labor, tools, appliances, materials, equipment, transportation and construction work of every kind required and incidental to the installation of elevators #1, #2, #3 and #4 at UNICOR, complete and ready for continuous satisfactory operation.

B. Performance Requirements: The elevators shall meet the following performance standards:

1. Contract speed shall mean speed in the up direction with full capacity load in the car. Speed variation under any load condition regardless of direction shall be no more than 3 percent.
2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per second and the maximum acceleration and retardation shall not exceed 0.2G per second.
3. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration. Stopping shall be without bumps or jars.
4. Full speed running shall be quiet and free from vibration and swaying. When car is standing at the floor with doors open, the doors shall remain firmly stopped and shall not "teeter".
5. Car shall not move from side to side during the process of opening and closing the doors.
6. Rope stretch recovery shall be provided to relevel cars at a floor, if the ropes slightly stretch.
7. Elevator control system shall be capable of starting the cars without noticeable "roll-back" of hoisting machine sheave, regardless of load condition in car or direction of travel.
8. Comply with IEEE Standard 519 to eliminate both electrical noise and audible drive noise by use of isolation transformers and line filters. Maximum Total Harmonic Distortion (THD) shall not exceed 5%.
9. Time to travel from one typical floor (3 to 4) to the next (about 10' 8") from start to stop of the elevator shall be no more than:
    - For Elevators 1, 2, 3: 4.8 seconds
    - For Elevator 4: 7.0 seconds
10. The door opening time shall be as follows: 2.3 seconds or less for 42" center-opening doors; 2.6 seconds or less for 48” center-opening doors. Door closing velocity shall not exceed one foot per second.
11. Cycle time shall be measured from the time the doors start to close until the car has reached the next floor level, with the car stopped within the level allowance of plus or minus ¼-inch and with the doors 75 percent (3/4) open. Times shall be not more than 9.6 seconds (Floor 3 to Floor 4 for elevators 1, 2, 3) without pre-opening. Times shall be not more than 12.3 seconds (Floor 3 to Floor 4 for elevators 1, 2, 3) without pre-opening. The measured floor to floor time interval shall be accomplished without releveling and with a maximum advance door opening action five inches from the floor level.
12. Car door open (dwell) time shall be 3.0 seconds minimum for a car call. Time shall be adjustable to suit building management efficiency and safety observations.

13. Notification of car lantern chime (from time of car door fully open/car lantern direction chime) for a hall call until car door starts to close shall be 5.0 seconds minimum. Time shall be adjustable to suit building management efficiency and safety observations.
14. Nudging shall not be initiated until interruption of door reopening device has exceeded 20 seconds.
15. Initial load weighing setting shall cause the car to bypass hall calls when car is loaded to 50% capacity. Setting shall be adjustable.
16. Performance shall meet or exceed the above minimums, including the requirements listed in 1.3 of this Section.
17. Prior to final acceptance and prior to the termination of the maintenance period, the elevators shall be adjusted as required to meet these performance requirements.

1.5 SUBMITTALS

A. General: Provide submittals in accordance with Conditions of Contract and to include at a minimum:

1. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures; and operation, control, and signal systems.

2. Shop Drawings: Include plans, elevations, sections, and large-scale details indicating service at each landing; control room layout; machine space layout; coordination with building structure; relationships with other construction; wiring raceway layout showing all control wiring and hookups in plan view; and locations of equipment including drawings of the car and hall fixtures, showing details of construction, fastenings to walls, location of “handsfree” telephone and emergency lighting and location of hall call equipment, etc. Show location of all equipment in inches from reference point. Include large-scale layout of car-control station. Indicate maximum dynamic and static loads imposed on building structure at points of support as well as maximum and average power demands.

3. Samples for Initial Selection: For finishes involving color selection.

4. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes, 3-inch-square Samples of sheet materials and 12-inch lengths of running trim members and handrails. Samples of Braille plates. Sample of call button and car panel finish.

5. Informational Submittals including: Qualification Data for Installer; Manufacturer Certificates signed by elevator manufacturer, certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided; Sample warranty for special warranty.

6. Detailed Schedule of Values – including all elevator components listed individually. Provide labor values for installation of individual elevator components.

7. Features for accessibility for persons with disabilities including Braille plates and jamb designation.

8. Other drawings as required to illustrate the proposed installation.

9. All costs associated with the submittal packages shall be born on the contractor.

10. Provide a standard submittal register that identifies all items schedule for submittal and required by this section. Arrange register by specification section and item number for project tracking and coordination. Contractor should provide a submittal package with a table of contents, tabs and/or notes that clearly identify the information provided, where it is located and whether that information has been modified and/or updated since the previous submission in order to expedite the review process and to encourage a collaborative and efficient process for all involved parties

11. Provide Preventative maintenance schedule and “check-in/check-out” procedures. Submit sample service ticket and preventative maintenance records. Electronic maintenance records that do not provide sufficient detail shall be modified as required to provide all necessary information. On site records are required.

12. Key Personnel Names: Within 30 days of Notice to Proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to the project.

B. Shop Drawings: Contractor shall submit for approval Shop Drawings in accordance with the applicable requirements and information required on layout drawings per A17.1. The Contractor shall submit proof of Underwriters' acceptance and code approvals for equipment furnished. Shop Drawings shall show material type and gauge, general dimensions, methods of attachment, location and size of reinforcements and openings, and a general arrangement of components. If required in conjunction with the permitting process, drawings shall bear a Professional Engineer’s Stamp of a PE licensed in the jurisdiction of this project. Approval thereof shall not relieve the Contractor of compliance with the specification and full compliance with ASME A17.1 and related codes and standards, unless the attention of the Architect/Project Manager are called to the non-complying features in writing. Shop Drawings shall include fully dimensioned layout in plan and elevation showing the arrangement of equipment and all pertinent details of elevator including the following as applicable to the systems specified herein:

1. Driving machine, controller, VVVF drive and filter, governor and other components located in machinery space and control room space.
2. Car frame and platform, counterweight, sheaves, supporting beams, guide rails, buffers and other components located in hoistway.
3. Weights of principal parts and reaction loads on structure.
    a. Car rail bracket spacing.
    b. Vertical forces on rails at safety application.
    c. Forces on structure for other retarding device.
    d. Size and weight/foot of rail reinforcement, where provided.
    e. Impact loads imposed on machinery and sheave beams, supports and floors or foundations.
    f. Impact loads on buffer supports at maximum permissible speed and load.
    g. Horizontal forces imposed on the building structure stipulated by A17.1 – 2.11.8 and 2.11.9
    h. Total static and dynamic load from the governor, ropes and tension system.
4. Top and bottom clearance and overtravel of car and refuge space at top and bottom.
5. Location of circuit breaker, switchboard panel or disconnect switch, light switch and feeder extension points in machine room.
6. Location in machine room of outlets for connection of traveling cables for car light and telephone.
7. The name of manufacturer, type of style designation and any additional information called for below shall be listed on the shop drawings for each of the following items:
    a. Elevator controller.
    b. Wiring diagrams.
    c. Power door operator, motor, HP, etc.
    d. Door interlocks, electrical contacts and escutcheon plates.
    e. Hoistway access switches, top of car operating device, etc.
    f. Ropes (number, size, breaking strength, factors of safety).
    g. Machine
    h. Firefighters' Service features, details of components, instructions and signs.
    i. Power requirements for proposed system.
    j. Hall button fixtures, car operating panels, position indicator and intercom system.
    k. Cab Data: The Drawings submitted shall be as follows:

- Shop drawings for elevator car enclosures shall indicate cleaning instruction details and layouts. Layouts shall have complete dimensioned details of cabs including walls, ceiling and floor. Indicate materials, finishes, fasteners and required supporting members. Provide the following drawing details:
- Handrail, handrail mounting, handrail reinforcement
- Ceiling support system
- Lighting assembly
- Base and base mounting details
- Concealed vent slot arrangement, if used
- Scaled cross sections through wall panel
- Full details at front return panel including fixture layout and all engraving
- Front return applied car panel hinging and locking system
- Coordination detail between front return and handrail
- Integration of cab relative to platform and sling structure

8. Submissions (as requested by the Architect) shall include:

   a. See Division 142123.13 Section 1.5 A.

9. Elevator layout including Machine Room, Hoistway Plan View, and Elevation, which shall be plotted from a computer aided design package and drawn to scale. Hand drawn submissions will not be accepted. Show all adjoining and related structures including shaft steel and/or concrete beams, columns, column lines, etc. Include the following at a minimum:
   a. Elevator car enclosure details and layout.
   b. Hoistway entrance door details complete.
   c. Fixture drawings.
   d. Car frame and car platform construction details and layouts.
   e. Machine isolation foundation fastening details (include manufacturer's data of all isolation equipment used).
   f. Shop drawings log shall be maintained by the Contractor.

D. Arrangement of Equipment:

1. Clearance around equipment located in the control room and machine space shall comply with the applicable provisions of the ASME A17.1 and the National Electrical Code.
2. Equipment in the elevator machinery space shall be so arranged that the rotating elements, sheave, etc., can be removed for repairs or replacement by conventional means, without dismantling or removing other equipment components in the machine room.
3. Elevator controller location shall be indicated on the drawings.

E. Quality Control Submittals:

1. Design Data: Include information on VVVF drive, door and landing control systems, programming instructions for communication systems and data sheets for car and hall fixtures.
2. Test Reports: After final testing and turnover, the Contractor shall provide the Purchaser with a copy of the inspection certificate, a completed field and test data report, Full Load Acceptance test report, and a letter stating when the test was performed and that the equipment installed under this specification passed the inspection.
3. Provide a Maintenance Control Plan as defined in ASME A17.1
   a. For each elevator, prepare and provide a written Maintenance Control Program (MCP) that complies with ASME A17.1 Section 8.6, including written documentation that details the test procedures for each and every test that is required to be performed by ASME A17.1. Assemble all MCP documentation, and supporting technical attachments, in a single MCP package and provide in both electronic and hard copy. Assemble entire hard copy MCP in 3-ring binders. For each elevator provided, the MCP must include only documentation and instruction that apply to the elevator specified.

      Binders to include:

      - Equipment and components, descriptive literature
      - Performance data, model number
      - Installation instructions
      - Operating instructions
      - Maintenance and repair instructions
      - Spare parts lists and current price lists
      - Lubrication instructions
      - Detailed, record and as-built layout drawings
      - Detailed, simplified, one line, wiring diagrams. Provide one complete set per manual
      - Field test reports
      - Complete set of contract software

   b. For each elevator, provide an additional, separate binder that includes all maintenance, repair, replacement, call back, and other records required by ASME A17.1/CSA B44. The records binder must be kept in the elevator machine room, maintained by elevator maintenance and service personnel, and be available at all times to authorized personnel.

   c. Provide detailed information regarding emergency service procedures and elevator installation company personnel contact information. Provide a listing of all tools to be provided to the Purchaser as components of the elevator system.

4. Certificates:

   a. All welding performed under this Section shall be performed by experienced welders in a neat and workmanlike manner. All welding on structural steel shall be performed only by persons who are currently qualified in accordance with ANSI, certified by the American Welding Society, ASME or an approved independent testing laboratory; and each such welder shall present this certificate attesting his qualifications to the Purchaser's representative whenever requested to do so on the job.

F. Contract Close-out Submittals:

1. Provide five (5) sets each of MCP, parts catalogs, maintenance instructions, complete, legible "AS-INSTALLED" field wiring diagrams (including straight line diagrams) showing all electrical circuits, for all equipment furnished. Changes made shall be noted on the drawings in adequate time to have the final drawings reproduced. One of the Document sets shall be electronic

G. Operation and Maintenance Data:

1. Repair Requirements: For elevator microprocessor control system, provide maintenance diagnostic tools, electrical schematic wiring diagrams, and any access codes and passwords required for all maintenance functions, including diagnostics, adjustments, and parameter reprogramming. Tools may be hand held or built into the control system and shall function for the life of the equipment. Tools that require recharging or reprogramming shall not be used. Provide complete operation and maintenance manuals including diagnostics instruction for troubleshooting the microprocessor system. Operating and maintenance data, tools and diagnostic equipment shall become property of the Purchaser.
2. Sixty (60) days prior to the completion of the work of the contract, the Contractor shall submit to the Project Manager four (4) copies of an Operation Maintenance and Parts Manual and four (4) complete sets of as-built drawings and wiring diagrams. These shall be reviewed, and if approved, shall become the property of the Purchaser. At a minimum, the following information relating to the elevators shall be included:
   a. Owner's Information Manual containing current data on major components, their maintenance and adjustment.
   b. Installation and Troubleshooting Manual (Adjuster’s Manual).
   c. Description of system operating features and system installed.
   d. Wiring diagrams needed for field troubleshooting, adjustment, repair and/or replacement of components.
   e. Controller and landing control device including parts information on relays, printed circuit boards, reverse phase relays, switches, lamps, electrical cables, monitors, modems, diagnostic hardware, diagnostic software and overload protection devices.

f. Door assemblies including hangers, rollers, door motor, door operator, door clutch assembly, door closers, door drive arms, related hardware, sheaves, door guides, interlocks and infrared door reversal devices.

g. Signal equipment including car stations, hall stations, position indicators, direction indicators, fire service panel, smoke detectors, key switches and pushbutton assemblies.

h. Car top inspection stations, limit switches, solid state leveling control units, leveling switches and alarm bell.

i. For traction units: machine, motor, brake, emergency brake, safeties.

j. Include operation and maintenance instructions, parts listing with sources indicated, recommended parts inventory listing, emergency instructions, and similar information. Include adjustor's manual with diagnostic and repair information available to manufacturer's and installer's maintenance personnel.

3. All symbols shall be listed corresponding to the identity or markings on both machine room and hoistway apparatus of the system specified. Wiring diagrams shall also include values of capacitors and resistors.

4. Maintenance Data: At the project close-out, submit maintenance data and parts lists for materials and products.

5. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

6. Submit manufacturer's/installer's job specific operation and maintenance manual, in accordance with ASME A17.1/CSA B44 including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

7. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

## 1.6 QUALITY ASSURANCE

### A. Qualifications

1. Provide a designed and engineered elevator system by an elevator contractor regularly engaged in the installation of elevator systems. Elevator contractor shall have a history of at least three (3) years of successfully installing similar products to those specified.

2. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods for proper performance of the work in this section. All work shall be performed in strict compliance with the approved product manufacturer's printed instructions and the requirements of these specifications.

3. Utilize only licensed and certified elevator personnel for the installation, adjusting, testing, and servicing of the elevators.

   a. Perform all elevator related work under the direct guidance of a state certified elevator technician with a minimum of three years of

experience in the installation of elevator systems of the type and complexity specified in the contract documents. Provide an endorsement letter from the elevator manufacturer, certifying that the elevator specialist is qualified. All elevator technicians must carry a current certification issued by one of the following organizations:

1. National Association of Elevator Contractors (NAEC)
2. National Elevator Industry Education Program (NEIEP)

4. Provide components produced by manufacturers regularly engaged in the business of manufacturing, installing, and servicing elevators of the types required by this section of these specifications, and with a history of successful production with all provided products in satisfactory use in similar service.
5. Provide elevator components from manufacturers that provide factory training and online and live telephone elevator technical support to any elevator installation, service, and maintenance contractor.
6. Provide elevator components from manufacturers that guarantee accessibility to all replacement and repair parts and components to any elevator installation, service, and maintenance contractor. The elevator contractor or elevator manufacturer shall maintain availability of service parts to the Purchaser or their representative for a period which matches that of the reasonable life of the elevator equipment.

B. Certifications

1. Before accepting the elevator installation, the Contractor shall have a Qualified Elevator Inspector (QEI) witness required tests of the elevator installation. Any corrective work needed as a result of this testing shall be done by the elevator contractor at no cost to the Purchaser.
2. The Contractor shall coordinate all work with Purchaser's Representative and schedule the services of the Qualified Elevator Inspector (QEI) to make acceptance inspections and witness the Acceptance Tests performed by the Contractor as required by ASME A17.1 Code. All final testing including fire alarm device testing shall be accomplished in the presence of the approved agency.
3. Contractor shall submit copy of acceptance test report which includes documentation of the full load safety test and 125% brake test, including other required testing listed in SECTION 8.10.2 of ASME A17.1 and testing required by referenced standards in Section 1.3 of this Division.
4. Contractor shall submit a copy of filled out Field Test & Data Report sheets to elevator consultant.
5. Submit a certificate of completion upon completion of the elevator alteration, inspection and testing for the elevator machinery which indicates that the work has been tested in accordance with applicable NFPA and ASME A17.1 requirements and that the systems are operational, complete, and have no defects.
6. As a part of final acceptance of the project and in accordance with the General Conditions, the Contractor shall have the Qualified Elevator Inspector (QEI) conduct a full Acceptance Inspection and Test in accordance with ASME/ANSI A17.1 before final acceptance by the Purchaser. The Contractor shall obtain from

the elevator contractor and/or manufacturer and furnish to the Purchaser all data affecting the elevator installation or modification, including ‘as-installed’ circuit and control wiring diagrams and maintenance manuals.

C. Pre-Installation Conference:

1. Submit delivery schedule for major components and detailed installation proposed progress schedule for each elevator.
2. Attend conference to review proposed elevator installation, preparatory work and Purchaser acceptance requirements.

1.7 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection: The existing premises, including the building with all grounds and appurtenances, shall be protected from damage which might be done or caused by work performed under this Contract. Any and all such damages which occur shall be repaired by approved methods so as to restore the damaged areas to their original conditions. Do not overload, or permit facilities to interfere with progress. The Contractor shall provide protective materials and coverings where necessary to protect building surfaces and building contents from damage. Cribbing, shoring, and bracing shall be provided where necessary to guard against structural damage during execution of the work herein specified. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location. Protect all items against dirt and damage. The Contractor shall be held fully responsible for all damage until final acceptance. Any equipment or property of the Purchaser damaged by this Contractor or his employee’s, shall be restored to its original condition or replaced without cost to the Purchaser.

The A/E will designate a suitable area where the Contractor may store equipment until the work is completed. All equipment shall be stored at the sole risk of the Contractor.

If the Contractor utilizes a construction shanty or similar structure, he shall provide his own lock and key, but a duplicate key shall be furnished to the Project Manager. The assigned storage area shall be left clear and unencumbered of material or debris and shall be left in a broom-clean condition at the completion of the workday. An approved type "Fire Extinguisher" shall be provided and installed on a wall for each storage area assigned to the Contractor. The Contractor shall comply with all code requirements for construction of such shanty at his own expense (i.e., sprinklers, temporary electric, etc.).

B. Delivery: Provide cartons and crates sufficiently strong to prevent any damage to components/materials when shipped by common carrier to the job site. Deliver all material at the job site by truck transport for unloading by the Contractor. It is understood that the storage of the materials on site will be at the entire responsibility of the Contractor.

1.8 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Collect waste daily. Comply with NFPA 241 for removal of combustible waste. Enforce requirements strictly. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose in a lawful manner. Keep facilities clean and neat. Operate in a safe and efficient manner. Take necessary fire prevention measures.

B. Existing Conditions: UNICOR is located in at 400 First Street, N.W., Washington, D.C. Normal working hours are from 8:00 am to 5:00 pm or 7:00 am to 4:00 pm, or as approved by A/E and the Purchaser, Monday through Friday. Contractor shall provide a work force to install the elevator in accordance with the construction sequence approved by the Purchaser. Arrangements may be made with building management for after-hours work, if needed. High noise activities for extended periods shall be performed after normal working hours. Short periods of an increase in the noise level are acceptable. The machine room is located as shown on the drawings.

C. Field Measurements:

1. Contractor shall verify all dimensions before ordering material.
2. Contractor accepts elevator components in an “as is” condition.
3. The Contractor shall identify and describe all cutting and patching necessary for any fixtures and wiring to remote elevator devices, where required. Coordinate this preparatory work with other trades and perform new work in a timely manner. All cutting and patching in the shaft and machinery spaces for installation of elevator equipment provided under this division shall be the responsibility of this Contractor if shop drawings fail to indicate requirements.

1.9 SEQUENCE AND SCHEDULING

A. Time of completion is of the essence.

B. Contractor shall provide schedule information to Purchaser. Schedule shall indicate start dates and activity duration time for all elevator related activities. Schedule to include:

1. Development of installation drawings and component specifications.
2. Calculations.
3. Review of drawings, specifications, and calculations by the Engineer, Purchaser and elevator Consultant.
4. Project mobilization.
5. Installation schedule shall indicate start dates and major component work activity duration by elevator.
6. Final cleanup and testing.
7. Final inspection, beginning of 1-year guarantee, and twelve (12) months maintenance service (NIS).

1.10 WARRANTY

General: Warranties shall be in addition to, and not a limitation of, other rights the Purchaser may have under the Contract Documents. Warranty shall be for a period of not less than one year and run concurrently with the initial 1-year maintenance service from time of final acceptance of specified work. The Contractor shall guarantee the materials and workmanship of the apparatus furnished under these specifications and shall make good any defects which may develop within one (1) year from the date of Purchaser's acceptance of each elevator not due to ordinary wear and tear or vandalism or improper or insufficient maintenance by others or abuse, misuse, or neglect or any other cause beyond the Contractor's control. Defects or equipment failures occurring during that one-year period shall be promptly corrected or repaired by the successful bidder at no cost to the Purchaser.

A. Submit warranty on letterhead of control manufacturer along with certification that installer is acceptable to the manufacturer if another manufacturer's control equipment is used.

B. The successful bidder shall provide one full year of complete maintenance service as part of this warranty. This service shall include monthly maintenance inspections and full preventative maintenance service, and emergency call back service 24 hours a day, seven days a week. (Note to Bidders: This means regular full maintenance will be performed one time per month unless callbacks exceed one per month, see Section 1.11.)

1.11 MAINTENANCE

A. Use the following specifications when providing interim maintenance and the initial one-year maintenance period following completion of the elevator. The routine maintenance shall include systematic examinations, adjustments and lubrication of all equipment at intervals not to exceed 1 month. The firefighters' recall test shall be performed at the code-stipulated frequency. Repair or replace any parts of equipment whenever required during the maintenance period and use only genuine standard parts produced by the manufacturer of the equipment installed. Should the callback frequency for normal wear and tear exceed an average of one callback per elevator per month, the frequency of examinations shall be increased until the reliability of the equipment conforms to the building standard of not exceeding one callback per month average for a given quarter.

Maintenance service shall include monthly examinations by trained employees and all necessary adjustments, lubrication, and parts to keep the equipment in reliable and safe operation. Reports of the monthly examinations, callbacks and repairs by Contractor shall be forwarded to the Project Manager as they are made. This service shall be performed by the Division 14 subcontractor. All work shall be performed by competent employees during regular working hours of regular working days, except emergency call back service shall be provided on a 24-hour basis without additional charge.

The Contractor shall notify the Purchaser's Representative prior to working on the equipment installed under this contract. The Contractor shall upon each visit record in detail work performed, parts and/or material replaced or repaired in the elevator machine

room log book and submit a copy of the same and receive a signature from the Purchaser's Representative after each visit. Note: It is the responsibility of the Contractor to respond to any emergency regarding the elevator. In the event that someone is trapped in an elevator that is under contracted maintenance at any time, the Contractor will respond to free the passengers as soon as possible to minimize the inconvenience to users. A detailed record of work performed by elevator mechanics shall be available to the Purchaser. Contractor shall respond to regular time call back service within 1.0 hour and to overtime call back service request by authorized personnel within 2.0 hours.

The Contractor shall be responsible to service, maintain and record testing of all elevator emergency circuits, (including the fire capture, related equipment and elevator sensors, emergency power, elevator emergency circuits and devices, including the firefighters recall, emergency power, emergency brakes, suspension means and A17.1 related safety tests of elevator devices) as part of the regular elevator maintenance contract. Testing shall be performed at intervals required by the A17.1 Elevator Safety Code and recommended by the manufacturer. The Category One test and inspections shall be performed prior to the end of the new installation service (NIS) and all deficiencies found shall be corrected as a part of the NIS.

B. All maintenance procedures shall be in accordance with the manufacturer's recommended procedures and in compliance with code requirements and intervals for performing required tests, such as monthly firefighters' service testing and annual no load test, at no additional charge as long as such tests are performed during normal working hours. The acceptance testing procedures shall be performed before Purchaser acceptance of each car at no additional charge.

C. All work under the maintenance provisions shall be performed by competent personnel under the supervision and in the direct employ of the Contractor and 24-hour emergency call back service shall be available at all times and be included in the cost of the contract.

D. Full protective maintenance requirements (at a Minimum):

1. Regularly and systematically examine, adjust, lubricate, clean and, when conditions warrant, repair or replace the following items and all other mechanical or electrical equipment in accordance with the manufacturer's requirements and ASME A17.1 Section 8.6 Maintenance, Repair, Replacement and Testing.
2. Machine, drive and deflector sheave, sheave shaft bearings, brake pulley, brake coil, brake contact, shoes and linings, and component parts, hoist ropes, steel cables, fastenings, monitoring devices and governor ropes.
3. Motor, motor drives, motor windings, rotating element, commutator, field coil, brushes, brush holders and bearings, rotors, stators, slip rings.
4. Governor, governor sheave and shaft assembly, bearings, contacts, governor jaws and governor ropes.
5. Deflector or secondary sheave(s), bearings, car and counterweight buffers, car and counterweight guide rails, top and bottom limit switches, governor tension

sheave assembly, compensating assembly, counterweight and counterweight guide shoes, including rollers or gibs.

6. All switches/contacts, operating devices, car and hall signal fixtures, interlocks, hoistway door hardware, tracks, air cord drives, hanger rollers, guides and retainers, door restrictors, infrared door reversal devices, shoes and linings, and component parts, and monitoring devices.
7. Controller, selector or landing control devices and dispatching equipment: all components including all relays, solid state components, resistors, condensers, transformers, contacts, leads, dashpots, computer devices, selector switches, mechanical or electrical driving equipment, coils, magnet frames, contact switch assemblies, springs, solenoids, resistance grids, hoistway vanes, magnets and inductors.
8. Hoistway door interlocks or locks and contacts, hoistway door closers, weather stripping, door sweeps, hoistway door hangers and tracks and hinges, bottom door gibs, cams, rollers, and auxiliary door closing devices for power operated doors.
9. Hoistway limit switches, slowdown switches, leveling switches and associated cams, vanes, and electronic components.
10. Guide shoes including rollers or replaceable gibs.
11. Automatic power operated door operators, door protective devices, car door hangers, tracks and car door contacts for both side slide doors.
12. Traveling cables.
13. Elevator control wiring in hoistway and machine room.
14. Car safety mechanism and counterweight safety mechanism, if provided, and load weighing equipment, if provided.
15. All car and hoistway operating fixtures including hall/car lanterns, main lobby fixtures, car operating panels, car position indicator, car fans, electric door operators, hoistway access switches, proximity/infrared devices, safety edge, photo eyes and door reflectors.
16. The guide rails shall be kept free of rust. Where roller guides are used, rails shall be kept dry. Rails shall be properly lubricated when sliding guides are used. Renew guide shoe rollers and gibs as required to insure smooth and satisfactory operation.
17. Examine and make necessary adjustments or repair to the following accessory equipment including relamping of signal equipment: corridor lanterns, car and corridor position indicators, car stations, traffic director station, electric door operators, interlocks, door hangers, auto-dial telephone systems.
18. Lighting: Contractor shall be responsible to relamp all lighting fixtures in the pit and hoistway (excluding cab lighting), as required. Batteries for emergency devices (car lighting, emergency communication devices, etc.) shall be included. Maintain cameras and monitors provided under this specification.

19. Cleaning: Contractor shall, during the course of all examinations, remove and discard immediately, all accumulated dirt and debris from the pit area. Prior to the expiration of the one-year new product service anniversary date of this Contract, the Contractor shall thoroughly clean down the entire hoistway including all equipment, ledges, separation beams, etc. to remove all accumulated dirt, grease, dust and debris. Pits shall be cleaned on a monthly basis.
20. Examine regularly and systematically all safety devices, and conduct an annual Category One test prior to the expiration of the new installation service.
21. Maintain all elevator equipment in hoistway, control room, machinery space, and pit in a clean, orderly condition, free of dirt, dust and debris.
22. Furnish lubricants compounded specifically for elevator usage.
23. Contractor shall not be required to make renewals or repairs necessitated by reason of negligence or misuse of the equipment or by reason of any other cause beyond the Contractor's control except ordinary wear and tear unless the Contractor receives just compensation.
24. The Contractor shall not be responsible for the following items of elevator equipment (unless damaged by him or his employees): cab interior (including removable panels, door panels, car gates, plenum chambers, hung ceilings, light diffusers, light tubes and bulbs, LEDs, handrails, mirrors and carpets), hoistway enclosure, hoistway door, frames and sills.
25. All work is to be performed during regular working hours of regular working days. Emergency calls shall be answered at all hours of the day or night.
26. The Contractor shall check the group dispatching systems (if applicable) and make necessary tests to ensure that all circuits and time settings are properly adjusted, and that the system performs as designed and installed.
27. Contractor shall perform the required mandated inspections and tests as required per local jurisdictions during the term of the included one (1) year maintenance contract and subsequent renewal or extension periods.

E. The Contractor shall keep the elevator maintained to operate at the original contract speed, keeping the original performance time, including acceleration and retardation as designed and installed by the manufacturer. The door operation shall be adjusted as required to maintain the original door opening and door closing times, within legal limits. Performance time, vibration and sound readings shall be maintained in accordance with NEII-1 published standards for new equipment.

F. The Purchaser reserves the right to make inspections and tests as and when deemed advisable. If it is found that the elevator and associated equipment are deficient either electrically or mechanically, the Contractor will be notified of these deficiencies in writing, and it shall be his responsibility to make the necessary corrections within 30 days after his receipt of such notice. In the event that the deficiencies have not been corrected within 30 days, the Purchaser may terminate the Contract and employ a Contractor to make the corrections at the original bidder’s expense.

G. Approximately three months prior to the end of the one-year term, the Purchaser may make a thorough maintenance inspection of all elevators covered under the contract. At the conclusion of this inspection, the Purchaser may give the Contractor written notice of any deficiencies found. The Contractor shall be responsible for correction of these deficiencies within 30 days after receipt of such notice.

H. Adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the Contractor shall be billed at an hourly rate. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

I. Elevator maintenance contractor shall have an office in the area that can provide emergency service within 1 hour during normal working hours and within two hours during other times.

J. All maintenance procedures and contracts shall be in accordance with Federal requirements and shall be based on the Purchaser's form of maintenance contract.

K. The Purchaser reserves the right to accept or reject any or all alternates.

1.12 COORDINATION

A. Coordinate installation of elevator equipment with integral anchors, bearing plates, inserts, beams, and other items that are embedded in concrete or masonry for elevator equipment both new and existing. Furnish templates, sleeves, elevator equipment with integral anchors, additional supports and installation instructions and deliver to Project site in time for installation.

B. Coordinate installation of structural work in other Sections.

C. Coordinate locations and dimensions of other existing work and items specified in other Sections that relates to the elevator(s), including pit ladders, electrical service, electrical outlets, ductwork and conduit, sprinkler systems, fire alarm systems, lights, and switches in hoistways, pits, and machine rooms; and all other work listed in this section

D. Coordinate work with the work of other trades for proper time and sequence to avoid construction delays and to ensure right of way of system. Use lines and levels to ensure dimensional coordination of the work.

E. Cooperate with all other building trades involved with this project at no added cost to the Purchaser. This cooperation includes providing access to the top of the car, pit, machinery space, control room, and hoistway for other Contractors involved in ancillary work to this project.

1.13 PERMITS

A. The Contractor shall file all necessary plans and applications and obtain the required permits and certificates.

B. The Contractor shall submit to the A/E or Purchaser's Representative a copy of the permit application, elevator specs, permits and prints of elevator drawings as submitted and approved by the Agency.

C. Upon completion of the work, and prior to final payments, tests may be made by the Purchaser, A/E and Consultant of all materials and appliances installed hereunder. The Contractor shall furnish all labor and materials required for such tests.

1. Should the tests show that any of the materials, appliances or workmanship are not first class or not in compliance with the Specifications, the Contractor, on written notice from the A/E, shall remove same and promptly replace them with other materials and appliances in conformity with the Specifications.

D. The Contractor shall perform all tests required by the authorities having jurisdiction in the presence of the Purchaser's representative and an authorized inspector to obtain Final Certificate of Inspection prior to turnover of the elevators to the Purchaser/Project Manager.

1.14 INTENT

A. All incidental work related to this installation, whether specifically defined or implied, that may be required shall be performed by the successful bidder and is included in the scope of this work.

B. The contractor shall perform all work in accordance to the contract documents, specifications, applicable codes, and/or any addenda and modifications made by the Purchaser.

C. The contractor shall provide all engineering, labor, equipment, and necessary materials for the complete installation of new microprocessor controls, drive, motor, wiring, car sling, platform, safeties, door operator, car doors, cab, and other components for the elevator(s) as listed and herein specified.

D. Provide specified equipment for the elevator(s) unless otherwise specifically stated.

E. All new equipment and materials furnished shall be specifically designed to operate with the original equipment being retained to assure maximum performance.

F. Contractor shall remove and legally dispose of all existing elevator equipment and related materials and debris as required for the installation of the new elevator equipment at no additional cost to the Purchaser.

G. Contractor shall install current model equipment with available replacement parts.

H. All labor and materials shall be "first-class".

I. Materials and equipment shall be installed and connected in accordance with the manufacturer's instructions and recommendations.

1.15 NOISE AND VIBRATION

A. Any noise or vibration due to faulty equipment or workmanship shall be corrected immediately without additional charge.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Elevator controller shall be solid-state microprocessor based for dispatch and motor control. Subject to compliance with requirements, provide controller products, non-regenerative drives, and resistor bank of one of the following:

Motion Control Engineering (MCE)

Smartrise

Alpha Elevator Controls

B. Subject to compliance with requirements, governor product of one of the following, or approved equivalent:

Hollister-Whitney

Unitec

Vertical Express

C. Subject to compliance with requirements, machine product of one of the following:

Imperial

Hollister-Whitney

D. Subject to compliance with requirements, provide roller guide products of one of the following, or approved equivalent:

Elsco

Hollister-Whitney

Vertical Express

Unitec

G. Subject to compliance with requirements, provide fixture products (car operating panels, position indicators, lanterns, and hall stations) of one of the following, or approved equivalent:

Innovation

Monitor

E. Subject to compliance with requirements, provide cab products (cab enclosures) of one of the following, or approved equivalent:

Gunderlin

Columbia

Eklund

Forms+Surfaces

SnapCab

FabACab

Quick Cab

G. Refer to balance of specifications for other acceptable products or manufacturers. For approval of equivalent products, submit information at time of bid.

2.2 MATERIALS

A. Steel

1. Structural Steel Shapes and Plates: ASTM A36 and AISI 1018

2. Sheet Steel for Exposed Work: Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.

3. Sheet Steel for Unexposed Work: Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A569

4. See related Sections.

B. Stainless Steel

1. Type 300 Series complying with ASTM A167

a. Supply with mechanical finish on fabricated work in the location shown or specified with texture and reflectivity required. Protect with adhesive plastic film or paper covering.

b. All finishes specified as “satin” to be as specified or shown on the drawings. If not specified or shown, then it shall be a manufacturer’s standard directional polish that complies with commercial No. 4 requirements

c. For hoistway doors and frames and exposed landing fixtures: Type 304.

C. Aluminum: Extrusions per ASTM B221: sheet and plate per ASTM B209

D. Paint

1. Exposed steel and/or Iron: Clean metal of oil, grease, scale, and other foreign matter and paint on shop coat of manufacturer’s standard rust-resistant primer.

2. Exposed Steel: Clean exposed metal or oil, grease, scale, and other foreign matter. Eliminate any dents, scratches, or other defects that would affect the final finish. For material delivered without a primer coat, apply manufactures standard rust-resistant primer. Apply two coats of enamel paint in a color as specified or selected by Interior Designer or Purchaser.

3. Machine Room Floor and walls and Pit Floor: Thoroughly clean and remove all foreign matter in final phase of alteration. Paint with two coats of paint in a color as specified or selected by A/E or Purchaser.

E. Removal of old material: Remove and dispose of all material from the old elevator system not used in the alteration.

F. Fire Resistance: Treat wood components with fire-retardant treatment conforming to requires of authorities having jurisdiction and to achieve flame spread rating of 25, ASTM E84.

G. Non-Shrink Grout: Pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 4000 PSI at 28 days

H. Wood: Panels to have minimum ¾-inch thick with particleboard or MDF cores, fire retardant treated. Provide anti-warp backing, registered with local authority having jurisdiction, for elevator finish materials. See architectural finish schedule and drawings for panel design and wood veneer types.

I. Low-Emitting Materials: Adhesives, sealants, paints and coatings applied within the building envelop and all composite wood and laminating adhesives (applied on and off site) shall comply with Federal standards for "Indoor Air Quality Management and with product requirements in "Sustainable Design Requirements – LEED for New Construction."

2.3 EQUIPMENT

A. MACHINE – Remove and legally dispose of existing machines equipped with DC motors and replace with new.

Elevators 1, 2 and 3 to be provided with gearless machines equipped with AC VVVF low slip motors, traction steel hoist 2:1 ropes with wedge type shackles and drive sheave, mounted on a bedplates resting on the existing machine beams. The machine beams shall be left in place. If the proposed machine requires a larger size or number/size beams/steel plates, beams/plates shall be provided by the Contractor. Secure new machine beams to existing machine beams with a sufficient number of cross beams or steel plates and adequate bolt connections.

Elevator 4 to be provided with a geared basement machine equipped with AC VVVF low slip motor, traction steel hoist 1:1 ropes with wedge type shackles and drive sheave, mounted to the existing anchor bolts embedded in the concrete. After existing machine for elevator 4 is removed, anchor bolts shall be examined for corrosion. Anchor bolts shall be cleaned and all rust shall be removed. New nuts shall be provided. Should the existing anchor bolts be found to have corrosion, the Contractor shall perform a pull-out test (proof load) on all anchor bolts to verify strength of existing anchor bolts based upon loads require for new equipment.

Contractor shall have a licensed structural engineer certify that the new connections and reactions are sufficient for existing machine beam supports. Proposed machine product data and method of fastening shall be submitted for approval prior to ordering.

Provide machine from manufacturer listed above. Provide new elevator duty AC hoisting motor that develops the required starting torque combined with a low starting current. Motor shall comply with NEMA MG1. The speed of the motor when operated with the controller in a full speed condition shall not vary more than 3% of the normal rated speed under all loads withing the capacity range of the elevator without regard to travel.

The motor horsepower rating and frame design shall be such that forced air-cooling is not required.

1. Color of machine to be gloss enamel manufacturer's standard color. Bedplates, and supporting steel shall be painted.
2. At the completion of the project, touch up and clean and paint machine with industrial grade enamel paint, utilizing equipment manufacturer's recommended procedures for cleaning, surface preparation, and painting.
3. The machine shall be mounted on vibration sound dampeners designed to isolate the unit from the building structure. Sound isolation shall be installed to reduce vibration and noise transmission to the building structure.
4. Machine shall be provided with guarding. Guarding shall allow for inspection of ropes and shall be designed to minimize impact on maintenance. Guarding shall have hinged or removable panels for inspection of equipment. Guarding shall have a safety yellow powder coating.

B. VVVF Drive – Provide drives of a heavy-duty design to vary the alternating current power supply to the hoist motor in order to provide sufficient current for smooth acceleration and deceleration of the elevator at contract with the rated load. A Variable Voltage Variable Frequency AC drive closed loop system shall be provided. Power for the system will be taken from the building's 3-phase power supply. Motor speed and torque shall be controlled by varying the frequency and amplitude of the AC voltage. Drive shall be adjustable to achieve the required motor voltage, current, and frequency, in order to properly match the characteristics of the AC elevator hoist motor. Contractor shall provide a drive using the latest state-of-the-art technology in order to provide quiet operation. Contractor is responsible for correctly sizing the drive. The drive will be rated at 240 starts per hour full load up. The system shall be non-regenerative.

1. If regenerative drive is provided, a means shall be provided for removing regenerated power from the drive's power supply during dynamic braking. This power shall be dissipated in a resistor bank that is an integral part of the controller. Failure of the system to remove the regenerated power shall cause the drive's output to be removed from the hoist motor.
2. The VVVF drive shall utilize encoder feedback to regulate hoist motor speed.
3. Provide equipment grounding in accordance with equipment manufacturers' recommended practices and in conformance with all applicable codes.
4. Provide protective devices to prevent damage on over or under voltage conditions.

C. ELEVATOR PROTECTION FOR ASCENDING CAR OVERSPEED & UNINTENDED CAR MOVEMENT - Provide a device that will offer protection for ascending elevator overspeed and unintended car movement by clamping of the hoist ropes.

C. AUTOMATIC SELF-LEVELING - The elevators shall be provided with automatic self-leveling landing control system that shall bring the elevator cars level with the floor landings + or - 1/4" regardless of load or direction of travel. The automatic self-leveling shall correct for overtravel or undertravel. Absolute encoder leveling devices shall be used.

D. CAR SLINGS – Retain existing. The car slings shall be checked and adjusted for square alignment and all connections shall be checked for tightness including bracing to support the platform and car enclosure. Clean and with field coat of enamel paint for car sling.

E. CAR SAFETIES – Provide new. Adjust as required to stop the car should it attain excessive descending speed. Test per ASME A17.1 including the 125% overload test. Follow A17.2 test procedures.

F. GOVERNOR

Elevators 1, 2, 3: Provide governors with two-way switches, new tension sheaves and governor ropes. The car safety shall be operated by the centrifugal speed governor located in the machine room. The governor shall actuate a switch when excessive speed occurs in either direction, disconnecting power to the motor and applying the brake before application of the safety.

Elevator 4: Provide pit mounted governor with remote activation, two-way switches, new tension sheave and governor rope. The car safety shall be operated by the centrifugal speed governor located in the machine room. The governor shall actuate a switch when excessive speed occurs in either direction, disconnecting power to the motor and applying the brake before application of the safety. Contractor shall hire a licensed structural engineer certify the new connections and reactions on new governor.

G. WIRING – Remove existing and provide. All wiring and electrical interconnections shall comply with the governing codes. Insulated wiring shall have flame retardant and moisture-proof outer covering, and shall be run in conduit, tubing or electrical wireways.

1. Traveling cables shall be flexible and suitably suspended to relieve strain on individual conductors. Traveling cables shall have minimum of 20% spare conductors (ends to be left accessible to facilitate connections at a later date), wiring as required for the auto-dial telephone, video monitoring, and firemen's communication (as required per local code), and six (6) pairs of 18 gauge shielded cables, (terminating on terminal strips in the controller and in the car operating station).

2. The entire wiring system shall be tested for insulation to ground. Include wiring for all hoistway electrical devices included in the scope of the elevator system, hall fixtures, pit emergency stop switch and the traveling cables for the car.

3. All wiring, regardless of voltage, shall be concealed or run in rigid steel conduit, EMT, metal raceways, and junction boxes. Conduit shall be painted in a color as selected by the Architect. Underground wiring, if provided, shall be encased in PCV. Flexible metal conduit may be used for short connections not subject to moisture, oil or embedded in concrete. Provide new ductwork and conduit. Coordinate ductwork and conduit locations with all work performed including but not limited to sprinkler, fire alarm, emergency power, and mechanical work.

    a. Conduit terminations shall have threaded connectors with steel lock nuts.
    b. Conduit fittings shall have threated insulation bushings on terminating points to protect the opening for the conductors.
    c. Provide raceway connections that are free of burrs, shoulders, or other projections that will reduce internal passage area or cause abrasion to conductors. Provide rubber edging around all internal raceway edges and controller connection points.
    d. Provide hoist motor junction boxes for wiring to motor.
    e. Provide conduit between mainline, controller, hoist motor, and other related components.
    f. Provide a minimum 2” displacement on electrical connections to machinery

4. Provide color coding or other suitable identification for each conductor of all single and multiple conductor cables.

5. Run all wiring from operating switches, safety switches, and control devices directly to the controller to permit easy testing and troubleshooting.

6. Install traveling cables so that they are free from contact with hoistway structure, car, counterweight, or other equipment. Contractor shall install shields and/or pads to prevent chafing.

7. Provide junction boxes with terminal blocks that have indelible identification numbers for each terminal connection.

8. Splices are not permitted except in junction boxes.

9. Provide proper shielding where applicable.

10. Provide a dedicated ground where required by equipment manufacturers.

11. Provide all wiring between the mainline, controller, VVVF drive, hoist motor, and other related components.

12. Provide additional wiring in traveling cable for fire alarm systems, emergency communication speakers, fire alarm announcements and related signals.

H. HOISTWAY OPERATING DEVICES –Provide hoistway stopping device switches and locate as required by A17.1 to slow down and stop the car automatically at the terminal landings and to automatically cut off the power and apply the brake, should the car travel beyond the terminal landings. Provide additional devices for solid state drives and speed changes and emergency terminal stopping devices.

I. PIT SWITCH – Where the pit is access from a pit ladder, provide emergency stop switches located in the pit 18 inches above access door, adjacent to pit ladder, accessible from the pit access door. When the pit exceeds 67 inches depth, provide an additional stop switch adjacent to the pit ladder and located approximately 47 inches above the pit floor. Where more than one switch is provided, they shall be wired in series.

Where the pit is accessed from a walk-in door or gate, provide emergency stop switch adjacent to access door.

J. BUFFERS

Elevators 1, 2, 3: Provide oil buffers with supports for car and counterweight. Paint buffer housing with a field coat of paint. Buffer support channels shall be cleaned and painted with field coat of enamel paint

Elevator 4: Retain existing spring buffers and supports. Clean, sand and paint existing buffers and support channels with field coat of enamel paint.

K. GUIDE RAILS

Elevator 1, 2, 3: Refurbish and reuse existing steel elevator car and counterweight guide rails. Clean, refasten and realign rails as required so that rails are plumb and securely fastened to the building structure. Clean rails for use with roller guides. Rail clips and bracket connections shall be checked and adjusted for square alignment and all connections shall be checked and adjusted for manufacturer’s recommended tightness. Paint unplaned rail surfaces and components with field coat of enamel protective coating.

Elevator 4: Provide 1 new steel elevator car rail section at top of shaft to replace the existing rail that was cut and re-welded. Retained existing steel elevator car and counterweight guide rails shall be refurbished and reused. Clean, refasten and realign rails as required so that rails are plumb and securely fastened to the building structure. Clean rails for use with roller guides. Rail clips and bracket connections shall be checked and adjusted for square alignment and all connections shall be checked and adjusted for manufacturer’s recommended tightness. Paint unplaned rail surfaces and components with field coat of enamel protective coating.

L. ROLLER GUIDES – Remove and discard existing guides and provide wheeled spring-loaded roller guide shoe assemblies with polyurethane wheels equipped with seismic retainer plates. Provide car roller guides to manufacturer's specified clearances and roller guide shoe pressure design parameters. Make adjustments necessary to obtain nominal measurement of 25 mg vertical vibration and 25 mg horizontal vibration (S/S and F/B). See National Elevator Industry, Inc. latest edition of Vertical Transportation Standards.

The cars are designed for class A loading. Verify clearances before ordering guides. The car frames and counterweight frames shall have roller-guide shoes attached at the upper and lower portions of the stiles.

M. PLATFORM – Retain existing. Paint components with field coat of enamel protective coating.

N. LOAD WEIGHING BYPASS – Provide load weighing devices set to operate at an adjustable pre-determined fixed percentage of the load in the car. The car shall bypass hall calls when this device is actuated. Initial setting shall be 50 per cent of rated load.

O. CAR & HOISTWAY DOOR POWER OPERATION – Remove existing and provide new car door operators. Provide high-speed, closed loop similar or equal to GAL MOFVR II door operators. Doors on the cars operate by means of high-speed door operators mounted on top of the cars. Operators shall power the doors at 3 feet per second opening speed. Provide car door reversal device and protective devices (restrictor) to prevent doors from being opened when car is not in the landing zone. Restrictor shall be of a design compatible with interlocks. Restrictors shall operate in conjunction with collapsable angles mounted to car doors and angles on fascia. An electric contact shall be provided on the car door to prevent the operation of the elevator unless the car door is closed. Operator and restrictor shall be approved before ordering and fully comply with this specification.

1. Provide emergency access unlocking devices for access to the hoistway at all entrances. Provide escutcheon plates on the hoistway doors. Provide escutcheon plates on the new hoistway door panels. Utilize welded or threaded support fasteners. Clip assemblies shall not be permitted. Tube finish shall match hoistway door trim.

2. Provide nudging operation on horizontal passenger doors. Nudging shall not start before 20 seconds have elapsed.

3. Emergency devices and keys for operating the doors from the landing shall be provided unless otherwise specified by local codes.

P. CAR AND HOISTWAY DOOR EQUIPMENT – Provide new for car and hoistway landings. All new hangers, tracks, closers, interlocks, gibs, clutches, etc. shall be provided.

Q. DOOR INTERLOCKS – Remove existing and provide new door interlocks and adjust for quiet operation and code required clearances. The doors at each hoistway landing shall be provided with approved type hoistway door interlocks of the hoistway unit system type, arranged for and provided with service and emergency keys as required by Code. An electro-mechanical interlock shall be provided on each hoistway door to prevent the operation of the elevator unless all doors are closed and locked. Provide hoistway door escutcheon tubes for emergency unlocking by authorized personnel for all hoistway

doors, utilizing welded or threaded support fasteners. Clip assemblies shall not be permitted. Tube finish shall match hoistway doors.

R. CAR DOOR PROTECTIVE DEVICE - Provide multi-beam infra-red screen, 3D type car door protection device.

S. CAR OPERATING PANEL AND CAR SIGNALS – Remove existing and provide new. Provide hinged, car stainless-steel operating panels. Main car panels shall have phone with required button and signage.

Car and hall fixtures shall be vandal resistant. Provide 1" diameter vandal resistant buttons with 1-3/8" metal halo in fixtures similar to Monitor Controls HPS Series in #4 satin finish stainless steel. Braille shall be adjacent to buttons and integral with car and hall buttons.

Provide 2" integral digital car position indicator in upper part of each car station. Panels shall contain a matching bank of mechanical illuminating buttons marked to correspond to the landings served, an emergency call button, door open and door close buttons, and alarm bell button.

Provide LED emergency car light with flush lens in car panel. Provide compartment for firefighters' devices in accordance with current code. Provide alarm bell or buzzer to be operated by the alarm bell button.

1. Provide keyed light switch, fan switch, independent service switch, inspection switch, in car stop switch and non-keyed emergency light test button (labeled "PUSH TO TEST") in a service cabinet located in the lower portion of the main car operating panel. When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are deenergized after 5 minutes and are re-energized before car doors open.

2. Panel for cars shall have stainless steel faceplate and flush or raised vandal resistant buttons with integral illumination. Buttons shall have adjacent raised handicap symbols integral to the left of button unit design with Braille. Red fill shall be used for emergency buttons/key switch devices. Tactile and visual control indicators (specified above), car button size (specified above) and location for the car buttons and car controls (emergency controls at 35", maximum height of floor buttons at 48" above car floor) shall be in compliance with ASME A117.1 standard specification 407.4.9 for Car Controls. Submit design for approval.

3. Provide speaker in car stations to provide for phone. The autodial telephone unit shall be concealed behind the faceplate. Provide a perforated hole pattern in the faceplate for speakers and microphone voice transmission. Basis of design is Monitor HPS1300 vandal resistant button design.

4. Engrave and fill black upper (stainless) portion of Firefighter's emergency panel faceplate with Firefighters' Service Phase II ASME A17.1 code-required wording

per FIG. 2.27.7.2 (heading 3/8" char., instructions .125" char.). Engrave and fill appropriate portion of main panel with instructions (1/8" char.) "YOU MAY SPEAK WHEN LIGHT IS ON - MOMENTARY LIGHT INDICATES ALARM RECEIVED" or other approved wording for intercom device specified under INTERCOM SYSTEM section elsewhere in this Section. Button for activation of intercom device shall be read "HELP". Engrave and fill black at top most (stainless) portion of main car panels as follows:

ELEVATOR 1

(use actual car # for each elevator in 1/2" char.)

CAPACITY 2100 POUNDS

(use actual car capacity for each elevator in 1/2" char.)

5. Provide an in-car camera and module for same to be added to work with monitoring system. Include traveling cable wiring for camera.

6. Car Position Indicator – A LED digital car position indicator shall be installed integral with the car operating panels. The position and direction of the car in the hoistway shall be shown by the illumination of the 2.0-inch-high or larger indications corresponding to the landing at which the car is stopped or passing. Submit design for approval. The lens shall be flush with the faceplate.

7. Car Panel Faceplate finish shall be #4 satin stainless steel.

8. Provide duplex GFCI convenience outlet in service cabinet of car operating panel.

9. Provide on the main panel a surface mounted certificate frame. Certificate Frame shall have durable Plexiglass window and be accessible. Minimum window size to be 8-inches wide by 5.25-inches high.

10. Keys for operating switches for car and hall fixtures shall be as follows or an approved equivalent (keying to be submitted with fixture drawings):

    a. Independent Service, Fan, Light – EX513
    b. Stop Switch – EX512
    c. Access Switch – EX514
    d. Firefighters' Service Switch – FEO-K1

T. COMMUNICATION AND INTERCOM SYSTEM - Provide intercom system, integral with new car operating panel. An emergency service intercom system for communicating between a 24-hour call location and the elevator car shall be provided. System shall comply with ASME A17.1 Section 2.27 and IBC requirements.

1. The system shall be of vandal resistant design and completely compatible with all connected equipment. System shall have the capability of sending building and elevator number to offsite personnel. The elevator cars intercom stations shall be

handsfree operation through microphones mounted in the speaker cabinet and speakers located behind the car operating panels. The elevator cars shall be furnished with concealed speakers with backboxes, integral with the new car operating panel faceplates. Provide all required speakers in cab. An LED in the car panel shall illuminate next to approved engraved wording when the intercom is in use, indicating help is on the way. Submit design of fixtures for approval. Include shielded wires in traveling cable for car speakers.

2. When the emergency call button within the car is pushed, a circuit shall be that will alarm the 24-hour emergency service provider via telephone line and establish voice contact through the elevator speaker and microphone. The called party shall have the ability to keep the intercom from automatically turning off. Provide Purchaser with documentation for maintaining and programming the system. Each elevator shall have a separate line.

3. The car unit shall have the ability to signal a deaf person that the emergency call has been acknowledged. Installation and programming shall be performed in accordance with the manufacturer's instructions. Upon deactivation of the car signal either through programmable timing or by the button, the communication system shall go into the off or stand-by mode. Intercom connection shall be provided between the car and control room master station which may be activated by an on-off switch in the control room. Calls may be initiated from the car, machine room, or any phone connected to Purchaser's communication system.

4. System shall be a visual and text-based and a video-based 24/7 live interactive system.

5. System shall be fully accessible by the deaf, hard of hearing and speech impaired, and shall include voice-only options for hearing individuals.

6. System shall have the ability to communicate with emergency personnel utilizing existing video conferencing technology, chat/text software or other approved technology.

7. Provide Line Monitor Alert Panel with audible and visual signal in the first-floor hall station to activate visual and audible signal in the event of a phone line failure.

8. Provide control room master station that shall utilize the phone system, have audible alarm, LED indicator light, digital display that shows which elevator is calling, and have ability to communicate with the trapped passengers. Contractor shall provide conduit and wire from machine room and control room master station and elevator controller. Master stations shall have the ability to make outside phone calls using phone system and ability to monitor and call back to the elevator as well as the ability to display the number of the elevator that has

made an emergency call. Install master unit according to the manufacturer's instructions.

9. Provide cellular device with appropriate SIM card to operate video monitoring device. Cellular device and SIM car shall be the property of the Purchaser. Contractor shall bear all costs associated with cellular device for the one (1) year new installation service period.

U. EMERGENCY CAR LIGHTING - Emergency power units employing LEDs and a sealed rechargeable battery and totally static circuits shall be provided that shall illuminate the elevator car and provide current to the alarm bell in the event of normal power failure. The equipment shall comply with the A17.1 requirements, be vandal resistant and be integral with the upper portion of the car panel. Means shall be provided to test unit from within the cab.

V. HALL CALL BUTTONS – Remove existing and provide new flush mounted hall buttons with applied faceplates. Each hall button fixture shall have buttons initiate a call with door time as required by ADA. Penetrations for fixtures shall be coordinated. All proposed additional penetrations shall be dimensioned on submittals prior to work being performed.

1. At each terminal landing provide new flush push button units and at each intermediate landing provide flush "UP" push button unit above "DOWN" push button unit. Provide Braille (with up or down) adjacent to push button, matching the car button design. For elevators 1, 2 and 3 provide two (2) hall call stations at each landing.

2. When a call is registered by momentary pressure on a landing button, an integral light in the button shall become illuminated and remain illuminated until the call is answered.

3. Provide fixtures at the Floor 1 (designated) landing with the Firefighters' Service Phase I key switch, jewel and engraved Phase I instructions per ASME A17.1 FIG. 2.27.7.1, and audible/visual communications failure devices.

4. For elevators 1, 2 and 3 provide two (2) risers of hall buttons for each landing.

5. For elevator 4 provide one riser of hall buttons for each landing.

6. Instructions shall be provided adjacent to each hall button fixture in accordance with ASME A17.1 corridor call station pictograph Fig. 2.27.9 and IBC requirements.

7. Provide non-directional brushed stainless steel 1" diameter buttons similar to Monitor Controls model HPS1300. Button shall have illuminating LED.

8. Faceplate finish shall be #304 stainless steel finish.

W. FIREFIGHTERS' SERVICE - Firefighter's Service operation shall be provided in compliance with the latest revision of the ASME A17.1 Code applicable to this work.

X. HALL LANTERNS AND POSITION INDICATOR – Provide new up/down arrows with minimum 2-½" illuminating triangles or arrows for up and down directions visible from the hall button for each elevator at each landing. Provide position indicators at each landing for each elevator to notify passengers at each landing of elevator position. When a car is stopping at a landing, the lantern indicating the direction in which the car is traveling shall become illuminated upon arrival of the car and a chime shall sound once for the "UP" direction and twice for the "DOWN" direction to announce the impending arrival or direction of travel of the elevator car. Timing of lantern chimes and illumination shall allow waiting passengers to see and hear the car lantern from the hall call station. Faceplate shall match hall button faceplate finish. Submit design for approval.

Y. INSPECTION OPERATION AND INSPECTION STATION – Provide a top of car inspection station with the following features:

1. On top of the car a fixture shall be provided containing continuous pressure "UP" and "DOWN" buttons, an emergency stop button, and a toggle switch. This toggle switch makes the fixture operable and, at the same time, makes the door operator and car and hall buttons inoperable.
2. Provide minimum (1) 110 Volt G.F.C.I. work outlet.
3. Provide a permanently mounted Stop switch on top of car reachable from landings when accessing the car top.

Z. HOISTWAY ACCESS - Provide access key switches in the car and at terminal landings in accordance with the latest applicable revision of the ASME/ANSI A17.1 Code.

AA. CONTROLLER AND DRIVE

1. Elevator control equipment must be sized to fit in space indicated on drawings and comply with NEC and A17.1 required clearances. Remove existing and provide new.
2. Elevator controllers shall be dedicated solid-state microprocessor controls with Selective-Collective Automatic Operation. Provide non-regenerative drive or regenerative drive with resistor bank as part of the solid-state microprocessor-based controller for dispatch and motor control. Provide variable voltage variable frequency alternating current (ac) drive control. Enclose control equipment in factory-primed and baked-enamel cabinets with hinged doors. The control systems shall be microprocessor-based for dispatch and motion control, capable of computer-based monitoring with terminals for connection. Controllers shall have the capability of remote diagnostics and internet/modem transmission of log faults to a future building management system.

3. Enclose control equipment in factory-primed and baked-enamel cabinets with hinged doors.

4. Micro-computer-based control systems shall be provided to perform all of the functions of a safe elevator motion and elevator door control. This shall include all of the hardware required to connect, transfer and interrupt power, and protect the motor against overloading. The systems shall also perform car operational control of a duplex collective system with home landing feature than can be turned on and off from the controller. Include independent service.

5. Each controller cabinet containing memory equipment shall be properly shielded from line pollution. Micro-computer systems shall be designed to accept reprogramming with minimum system down time. Color of controllers to be enamel finish in manufacturer's standard color. Touch-up any defects in paint prior to Purchaser acceptance.

6. The systems shall utilize a device to establish incremental car position to an accuracy of .1875 inches or better using quadrature signal for the entire length of the hoistway. Absolute floor number encoding with parity shall be provided at each floor in order to establish exact floor position to the computer. The systems shall not require movement to a terminal landing for the purpose of finding the correct car position. The hoistway landing system shall be designed to provide precise information to the controller as to the absolute position of the car in the hoistway. With the car at a landing, the landing system shall indicate to the controller the actual floor number. As a result, movement to terminal landings or specific floors shall not be necessary to establish car location within the building.

7. The systems shall utilize an automatic two-way leveling device to control the leveling of the car to within 1/4" above or below the landing sill. Overtravel, undertravel, or rope stretch must be compensated for and the car brought level to the landing sill.

8. The individual car controller shall be capable of learning the position of each floor in the building to an accuracy of .1875 inches.

9. The control system shall be equipped with a 16/32 or larger microprocessor for maximum processing, adjusting, and diagnostic capability.

10. The car controller shall have a software program that uses mathematical methods to create an idealized optimum velocity profile of car travel from any floor to any other floor, providing a smooth and stepless elevator ride. All the system motion parameters (jerk, acceleration, deceleration rates, etc.) shall be field programmable with parametric limitations for the system dynamics, and be stored on EPROM as non-volatile memory.

11. The elevator controller shall utilize a generic, non-proprietary microprocessor-based logic system and shall comply with ASME A17.1 safety code for elevators.

12. The drive control system shall utilize the optimized velocity profile in a dual-loop feedback system based on car position and speed. A velocity feedback device shall permit continuous comparison of car speed with the calculated velocity profile to provide accurate control of the acceleration and deceleration, right to the final stop without discomfort, regardless of direction of travel or load in the car.

13. The system shall provide comprehensive means to access the computer memory for elevator diagnostic purposes without need for any external devices, and shall have permanent indicators to indicate important elevator statuses as an integral part of the controller. Systems that require hook up of external devices for troubleshooting are not acceptable.

14. The individual car controller shall have an independent safety processor that monitors the speed of the car and creates a phantom speed contour near the terminal landing, so that the car would not be capable of traveling faster than the phantom speed contour. This processor should work independently of any other logic or motion control processors in the system.

15. Dedicated permanent status indicators shall be provided on the controller to indicate when the safety string is open, when each door lock is open, when the elevator is operating at high speed, when the elevator is on independent service, when the elevator is on fire service, when the elevator out of service timer has elapsed, and when the elevator has failed to successfully complete its intended movement. In addition, a means shall be provided to display other special or error conditions that are detected by the microprocessor.

16. An out of service timer shall be provided to take the car out of service if the car is delayed in leaving the landing while there are calls existing in the system.

17. The controller shall provide the required electrical operation of the elevator control system including the automatic application of the brake, which shall bring the car to rest upon failure of power. In addition, the power control shall be arranged to continuously monitor the actual elevator speed signal from the tachometer and to compare it with the hoist motor armature voltage and the intended speed signal, to verify safe and proper operation of the elevator. Provide circuit to allow test of fault, if caused by brake failure, by allowing a qualified technician to operate a constant pressure button for the rope brake reset, which if released prior to a designated short preset time, would then reapply the rope brake. The constant pressure button shall be provided by the rope brake manufacturer.

18. The power control shall be arranged to continuously monitor the performance of the elevator such that if the car speed exceeds 150 fpm during access, inspection, or leveling, the car shall shut down immediately, requiring a serviceman to reset it.

19. Provide isolation transformers, chokes, and/or line inductors plus proper filtering to eliminate both electrical and audible noise of VVVF drives.

20. Provide a surge-protective device (SPD) as an integral part of the elevator system or installed immediately adjacent to the disconnecting means per NFPA 70 requirements.

    - Provide line side lugs for UL1449 listed 480V-3 Phase, 3 wire surge suppressor close nippled to controller box
    - Provide 3 phase 600V terminal block with 20A fuses
    - Provide 3#8-1#8G from line side lugs to TVSS via 20A fuse block

21. Door protection timers shall be provided for both the opening and closing directions which will protect the door motor and will help prevent the car from getting stuck at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event that the doors are prevented from reaching the open position. In the event that the door closing attempt fails to make up the door locks after a predetermined time, the door close protection timer shall reopen the doors for a short time. If, after a predetermined number of attempts, the doors cannot successfully be closed, the doors shall be opened and the car removed from service but shall sound alarm (buzzer) until condition is corrected.

    a. A minimum of four different door standing open times shall be provided. A car call time value shall predominate when only a car call is canceled. A hall call time value shall predominate whenever a hall call is canceled. In the event of a door reopen caused by the door reversal device, a separate short door time value shall predominate. A separate door standing open time shall be available for lobby return.

    b. If the doors are prevented from closing for longer than a predetermined time, a buzzer shall sound or the voice annunciator, if provided, shall ask that the obstruction be removed.

22. Car and hall call registration and lamp acknowledgment shall be by means of a single wire per call, in addition to the ground and the power bus. Systems that register the call with one wire and light the call acknowledgment lamp with a separate wire, are not acceptable.

23. Firefighters' Phase I emergency recall operation, alternate level Phase I emergency recall operation, and Phase 2 emergency in-car operation shall be provided according to applicable local codes.

24. A relay panel inspection switch and an up/down switch shall be provided in the controller to place the elevator on inspection operation and allow the user to move the car in the hoistway. The car top inspection switch shall render the relay panel inspection switch inoperative.

25. A timer shall be provided to limit the amount of time a car is held at a floor due to a defective hall call or car call, including stuck push-buttons. Call demand at another floor shall cause the car, after a predetermined time, to ignore the defective call and continue to provide service in the building.

26. The microprocessor boards shall be equipped with on-board diagnostics for ease of troubleshooting and field programmability of specific control variables. The field changes shall be stored permanently, using non-volatile memory. The microprocessor board shall provide the features below.

    a. On-board diagnostic switches and an alphanumeric display. These switches and displays shall provide user-friendly interaction between the mechanic and the controller.
    b. On-board real time clock. The real time clock shall display the time and date and be adjustable by means of on-board switches.
    c. Field programmability of specific timer values (i.e., door times)

27. The elevator shall not require the functioning or presence of the microprocessor to operate on car top inspection or hoistway access operation to provide a reliable means of moving the car if the microprocessor fails.

28. A phase quality monitor shall be provided that monitors high or low voltage, phase loss, phase imbalance or phase reversal. The monitor shall be manual reset type.

29. For elevator microprocessor control system, provide maintenance diagnostic tools, electrical schematic wiring diagrams, and any access codes and passwords required for all maintenance functions, including diagnostics, adjustments, and parameter reprogramming. Tools may be hand held or built into the control system and shall function for the life of the equipment. Tools provided shall be usable throughout the life of the equipment without the requirement to return to the manufacturer. Provide complete operations and maintenance manuals including diagnostics instructions for troubleshooting the microprocessor system.

30. VVVF DRIVE - A Variable Voltage Variable Frequency AC drive system shall be provided. Power for the system will be taken from the building's 3 phase power supply. Motor speed and torque will be controlled by varying the frequency and amplitude of the AC voltage. The system shall be non-regenerative.

AB. INDEPENDENT SERVICE - A switch shall be provided in the car operating panels for Independent Service. Independent service operation shall be provided in such a way that actuation of a key switch in the car operating panel will cancel any existing car calls, and hold the doors open at the landing. The car will then respond only to car calls. Car and hoistway doors will only close with constant pressure on a car call push-button or the

door close button. While on independent service, hall arrival lanterns or jamb mounted arrival lanterns shall be inoperative.

AC. SELECTIVE COLLECTIVE AUTOMATIC OPERATION

Systems shall be a state-of-the-art elevator control systems which employs high-speed microprocessors to perform "real time" analysis of passenger traffic conditions. Provide landing control system for each elevator. For elevators 1, 2 and 3 provide selective collective automatic operation for the group using a microprocessor-based controller with automatic operation by means of the car and hall buttons. For elevator 4 provide selective collective automatic operation using a microprocessor-based controller with automatic operation by means of the car and hall buttons. Each hall button and car button initiates a separate call. Car calls and up and down hall calls can be registered at any time. All calls shall remain registered even if the emergency stop switch is opened or the power fails. The car shall answer all car calls and hall calls in the order in which the landings are reached. Car button preference shall be available to the incoming passenger. Provide an adjustable home landing feature which can be turned on or off from the controller, access key switch operation and independent service. If all calls in the system have been answered and home landing is turned off, the car shall park at the last landing served. Assignment of hall calls shall be designed to minimize service waiting times.

AB. EMERGENCY POWER OPERATION (EPO)

1. Provide controls with necessary materials, circuitry and software for emergency power operation with automatic car selection.
2. In the event of a loss of normal power, an elevator in motion will make an emergency stop. When stabilized standby power is available, it will be transferred to the elevator feeder. A signal provided to the elevator feeder and a signal provided to the elevator controller will indicate that emergency power has been established. When emergency power has been applied to the elevator controller, the operating system will automatically select the elevator in the building, start and return it to the main floor and remove it from service. The operating system will then automatically place the elevator in service for operation. The control manufacturer shall provide for recognition of a signal from the generator control system prior to returning to normal power from auxiliary power so that an adequate delay is provided to allow the running elevator to park at the nearest floor in the direction it is traveling prior to switching from auxiliary power to normal power.
3. Existing emergency power generator to be provided with necessary auxiliary contacts and pre-signal device to elevator. Contractor shall provide weights and manpower to test EPO system at acceptance test.
4. Coordinate emergency generator normal, emergency power and pre-signal requirements with other Divisions requirements. System to operate elevator on generator power.

AC. SYSTEM SUPPORT - The following equipment and technical support shall be provided:

1. Provide a diagnostic means to Display on-board monitoring system. Hand-held devices may be utilized in lieu of keyboards

2. Provide digital to analog motion and speed control, absolute encoder leveling device connected to car with leveling memory not affected by power failure. Controller shall have PC boards manufactured by the controller manufacturer, selectable interval adjustment devices and have a minimum 6/32-bit processor or higher. Contractor training course for the elevator installer's personnel shall be provided by the controller manufacturer.

AD. ENCLOSURE

1. Provide cab as specified herein. Cab interiors shall be provided with custom interior walls, handrails and ceiling design, including lighting. New car doors and other hardware, shall be included in the bid price.

2. The exterior of the car enclosure shall receive a coating of sound-deadening material.

3. Interior Panels:

   Elevators 1, 2, 3: Basis of design is Quick Cabs Cubix layout. Panels shall be wood veneer. All reveals shall be black. Provide mounting method which prevents rattling or vibration. Provide base (toe kick). Panels shall have concealed ventilation. Submit design for approval. Provide round 1.5" handrails with end that return to walls on side walls and rear of elevator.

   Elevator 4: Basis of design is Quick Cabs Revenna layout. Panels above handrail shall be laminate with wood grain finish. Panels from handrail and below shall have 5WL texture stainless-steel finish. All reveals shall be stainless-steel. Provide mounting method which prevents rattling or vibration. Provide base (toe kick). Panels shall have concealed ventilation. Submit design for approval. Provide round 1.5" handrails with end that return to walls on side walls of elevator.

4. The walls shall be supplied with the hardware necessary to attach pads. The protective pads hooks shall be permanently mounted at the sides, rear and fronts of the car enclosure.

5. Lighting for the elevator shall be provided with dimmer switches on the power supply. Man-D-Tec 4590 LED-Linear is basis of design. Provide emergency light system similar to ELS-L4 for (Powers lighting fixtures during a normal power failure). Light fixtures that extend above car top shall have a metal enclosure around the fixtures located above the car top to prevent damage to the fixtures.

6. Provide new car top safety railings as required by code.

7. On the car side, each door shall have a minimum 20-gauge satin finished stainless steel facing. Door facing shall extend around its leading edges. Car doors shall be provided with new applied hangers, tracks, guides, hanger rollers and air cord drives. The doors shall be hung on the new door hangers, and have new bottom door guides provided. There shall be two door guides per panel. A safety retainer bracket shall be provided on each door panel similar to the ones that are installed on hoistway doors. Bent down devices such as “fire tabs” will not be permitted as the sole means of bottom door retainers.
8. Comply with ASTM D 256 for impact resistance and ASTM E 84 for flame spread and smoke developed characteristics.
9. Provide island ceiling with concealed heavy-duty frame, with adjustable mounting legs and divided into equal sections, with a removable panel for access to the escape hatches.
10. Ceiling shall have hairline joint for escape hatches. Submit design for approval.
11. Steady Plates (Cab Steadiers): Provide steady plates between canopy and side stiles to prohibit shake or shifting of the elevator cab during running and door operations. Steady plates shall have a minimum of three (3) post wise adjustments and shall be equipped with rubber isolation.
12. Provide hairline joint for emergency top exit. The top emergency exit shall be provided with lock and electrical contact. Top exit shall be capable of being opened without tools from the car top.
13. Provide 2-speed exhaust blower integral with car top, installed in accordance with item 2.14.2.3. Provide white matte grill around fan openings. Isolate cab fan from canopy to minimize vibration and noise.
14. Provide extruded aluminum car sills.
15. Cab flooring covering shall be selected in conjunction with cab interior finishes and is part of the cab allowance. Car sill shall be flush with finished flooring surface. Flooring shall not interfere with opening/access of COP. Verify finished flooring height before ordering car sill. Contractor shall provide and install flooring.
    a. Prepare the car platform sub-surface, as required, to accept the flooring so that no imperfections are visible.
    b. Provide all required assistance to the flooring contractor and all required standby labor, relative to the installation of the finished flooring of the car enclosure.
16. Provide one set of pads with hooks and hangers for each elevator.
17. The car enclosure shall comply with the latest revision of the ASME A17.1 code.

18. Panel construction and all cab materials shall be in conformance with A17.1 – Section 2.14 and manufacturer shall provide certification of this on cab drawings.

19. Trademarks: Do not display manufacturers name or trademark on exposed surfaces of materials or components, which can be seen by persons using the elevator.

AE. PASSENGER HOISTWAY ENTRANCES

Hoistway doors and frames are shown below in the following specifications:

1. Entrance Frames: Reuse existing. Clean and paint.

2. Car Door Panels: Provide new stainless-steel

3. Hoistway Door Panels:

   Elevators 1, 2 and 3: Provide new. All door panels shall be provided with escutcheon access tubes (threaded or welded, clip assemblies not permitted)

   Elevator 4: Retain existing.

4. Hoistway Sills: Reuse existing. Shim as required to meet A117.1 Rule 407.2.9, maximum running clearance of 1¼". Sills shall be properly supported and attached to the building structure. Provide grouting beneath sills.

5. Car Sills: Provide new extruded aluminum

6. Fascia: Retain existing. Where fascia is missing, provide new No. 14 gauge steel plates. Fascia shall be suitably braced to prevent deflection of ¼”. Clean, sand and paint all fascia with field coat of enamel protective coating.

7. Toe Guard (Car Apron): Provide new 48” with enamel protective coating

8. Dust Covers: Provide new No. 14 gauge sheet steel. Clean, sand and paint with field coat of enamel protective coating.

9. Headers: Retain existing. Clean, sand and paint with field coat of enamel protective coating.

10. Struts: Retain existing. Clean, sand and paint with field coat of enamel protective coating.

11. Hangers: Provide applied with retainers. Provide top and bottom retainers and two-point suspension hangers and rollers, tracks, transmission devices, heavy duty guides and spirator closers.

12. Hanger Covers: Provide removable, full-length No. 14 gauge steel. Covers shall be made in sections for convenient access to hangers. Clean, sand and paint with field coat of enamel protective coating.

13. Bottom of all Hoistway Doors: Provide new heavy-duty guides & fire stops. Provide new phenolic gib inserts in guides. Secure all guides.

14. Hoistway Door Marking: Landing designations shall be permanently applied to the inside of each door panel. Paint, stencil or apply decal markings on hoistway side of doors.

15. Sight Guards: Finish to match existing frames.

16. Bottom of Car Doors: Provide heavy-duty 2 guides per panel with retainer.

17. Handicapped Jamb Markings: Provide cast-type stainless steel jamb marking plates for all floors on each side of hoistway jambs. Braille plates to be 60 inches from the floor to centerline of characters with 2-inch-high floor markings, contrasting colors and Braille. Provide new stainless steel 4" x 4" plates with raised letters/numerals and braille at each floor on both sides of the entrance jambs. Provide car identification numbers on landings. Provide 4" x 4" “star of life” plate at each designated landing entrance as required. Submit design for approval.

18. Labels (U/L)): Entrance devices provided under this contract shall be manufactured in accordance with the procedures established by Underwriters Laboratories or other approved testing laboratory and shall be so labeled.

2.4 FABRICATION

A. RUNNING CLEARANCES

1. Running clearances between the car sill and the hoistway sill shall be adjusted to provide an optimum running clearance of 1-1/4 inch per A117.1 Rule 407.2.9.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. VERIFICATION OF CONDITIONS:

1. Verify that hoistway, pit and machine room are ready for work of this Section.

2. Take field dimensions. Verify shaft and openings are of correct size and within tolerances. Verify, by measurements at the job site, dimensions affecting the work. Bring field dimensions which are at variance with those on the accepted shop drawings to the attention of the Project Manager. Obtain the decision regarding corrective measures before the start of fabrication of items affected.

3. Examine surface and conditions to which this work is to be attached or applied, and notify the A/E in writing if conditions or surfaces are detrimental to the proper and expeditious installation of the work. Starting the work shall imply acceptance of the surfaces and conditions to perform the work as specified. Examine conditions of substrates, supports, entrances, and other conditions under which this work is to be performed.

4. Study the Contract Documents with regard to the work as shown and required so as to insure its completeness.

5. Cooperate in the coordination and scheduling of the work of this section with the work of other sections so as not to delay job progress.

3.2 PREPARATION

A. Protection:

1. The Contractor shall construct and maintain full height barricades for all elevator work as required to keep unauthorized persons and the general public a safe distance from work and material storage areas. At no time shall barricades be arranged in such a way as to obstruct or impede safe egress from the building.

2. The Contractor shall cooperate with the Purchaser to protect the public and property and to maintain safe, secure conditions.

3. The Contractor shall provide screening between shafts where work is being performed where there are multiple elevators in the same shaft. Screening shall be removed upon completion of the work.

3.3 INSTALLATION

A. Install system and components in accordance with specifications, drawings and ANSI/ASME A17.1.

B. Install components and connect equipment to building utilities.

C. Arrange components in control room so equipment can be removed for repairs or replaced without dismantling or removing other equipment components.

D. Adjust for smooth acceleration and deceleration of car so as not to cause passenger discomfort. Adjust elevator to meet the performance requirements.

E. Adjust automatic floor leveling feature at each floor to achieve maximum 1/4 inch from flush.

F. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system. Sound isolate machines and controllers from building structure. Isolate car fan from cab shell.

G. Install the elevator, using skilled workmen in strict accordance with the final accepted shop drawings and other submittals.

H. Install elevator cab enclosures on platform plumb and align cab entrance with hoistway entrances.

I. Remove oil, dirt and impurities and, unless indicated otherwise, give a factory coat of rust inhibitive paint to all exposed surfaces of struts, hanger supports, covers, fascias, toe guards, dust covers, car sling, pit equipment and other ferrous metal. Clean car top and paint with grey enamel protective coating.

J. Lubricate operating parts of system as recommended by the manufacturer.

K. Comply with the code, manufacturer's instructions and recommendations.

L. Accurately and rigidly secure supporting elements within the shaftways to the encountered construction within the tolerance established.

M. Erect guide rails plumb and parallel to a maximum of 1/8".

N. Install rails so that joints do not interfere with brackets.

O. Reinforce hoistway fascias to allow not more than ¼ inch of deflection.

P Arrange door tracks and sheaves so that no metal-to-metal contact exists.

Q. Pre-hang traveling cables for at least 24 hours with ends suitably weighted to eliminate twisting.

R. Mount operating fixtures with tamperproof screws. Coordinate fixture material and finishes with the A/E.

S. After installation, provide field touch up to surfaces of shop primed elements which have become scratched or damaged.

T. Provide and install motors, switches, controls, safety and maintenance and operating devices in strict accordance with the submitted wiring diagrams and applicable codes and regulations having jurisdiction.

3.4 APPLICATION

A. Interface with Other Products

1. Controller shall be fully compatible with all elevator equipment provided under this contract.

B. Welding

1. Obtain Purchaser's approval before performing any welding operations. All welding shall be oxyacetylene or electric arc. High test welding rods suitable for the material to be welded shall be used throughout. All special fittings shall be carefully laid out and joints shall be accurately matched at intersections. All welds shall be of sound metal free from laps, cold shuts, gas pockets, oxide inclusions and similar defects.

2. All necessary precautions shall be taken to prevent fire or other damage occurring as a result of welding operations. Approved fire prevention and fire management procedures shall be observed at all times. To avoid accidental or unnecessary activation of the fire alarm system, the Purchaser shall be notified prior to the commencement of cutting, burning or welding. Any work requiring removal or relocation of sprinkler heads or pipe shall require 7 days prior notice to the Project Inspector.

C. Miscellaneous Iron and Steel

1. Furnish and install all steel supports, hangers and other devices required to support and provide access to conduit, equipment, etc.

2. All work shall be cut, assembled, welded and finished by skilled mechanics. Stands, brackets, frameworks and platforms shall be properly sized and well-constructed.

3. Measurements shall be taken on the job and worked out to suit adjoining and connecting work. Members shall be straight and true and accurately fitted. Scale, rust and burrs shall be removed. Welded joints shall be ground smooth where exposed. Drilling, cutting and fitting shall be done as required to properly install the work and accommodate the work of other trades as directed by them.

4. Members shall be generally welded or riveted, except that bolting may be used for field assembly where welding or riveting would be impractical.

5. All shop-fabricated iron and steel work shall be cleaned and dried and given a shop coat of rust inhibitive primer and two coats of enamel paint on all surfaces and in all openings and crevices. All field connections shall have their surfaces thoroughly cleaned and be given one coat of rust inhibitive primer and two coats of enamel paint. All painting and surface preparation shall be in accord with Steel Structures Painting Council (SSPC) standards for painting structural steel and cast iron, as applicable.

6. All structural steel shall meet the requirements of ASTM A36. Cast iron shall meet the requirements of ASTM A48, Class No. 20.

D. Hangers and Supports

1. All required hangers, supports, clamps, sleeves, etc., required for installation of the electrical work are included as a part of the work of the Contract.

2. All horizontal runs of conduit shall be properly grouped and hung to true alignment using substantial and appropriate hangers, clamps, conduit straps, etc., equal to Kindorf, Unistrut or Caddy as applicable. Hanger and support locations shall be coordinated with work of other trades and existing work to avoid conflicts. Hangers and supports shall be placed at intervals not exceeding the spacing recommended by the NEC and NECA. Supporting rods shall be threaded only on ends, with an allowance for adjustment.

3. Wire and strap hangers will not be permitted. Conduit and fittings shall be secured by metal clips or straps using toggle bolts or lead expansion sleeves on masonry and wood screws on woodwork. Where fastened to bar joists, bulbtees and/or flange beams, wedge hangers, tap clips and flange clips as manufactured by Caddy or equal shall be used.

4. Inserts may be used in locations approved by the Architect and shall be Phillips "Red Head" or approved equal. Explosive powder studs or detonator assisted studs or anchors will not be permitted.

5. Conduit Sleeves and Openings - Wire and Cable

   a. All sleeves required to accommodate the work of this Contract shall be provided.

   b. All sleeves, where required, shall be extended l/4 inch beyond the finished surface in finished areas and 2 inches in Equipment and similar rooms. Conduits passing through fire walls and floors shall be fire-stopped with manufacturer's standard fire-stopping sealant having fire-resistant ratings for identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. System Design No. CAJ1134, CAJ1071, CAJ1142 - 2 hours, Floor & Wall Through - Penetration Firestop System.

   c. All conductors shall be copper.

E. GROUNDING

1. Provide grounding for all electrical equipment, apparatus and devices in accordance with the applicable requirements of the National Electrical Code. Coordinate “earth ground” location with contractor installing this system.

## 3.5 FIELD QUALITY CONTROL

A. Tests

1. Before accepting the elevator installations, the Contractor shall have an approved elevator inspector to test the elevator installations. Any corrective work needed as a result of this testing shall be done by the elevator contractor at no cost to the Purchaser.

2. Perform tests required by ASME/ANSI A17.1, a Qualified Elevator Inspector (QEI) and Representative of Purchaser.

3. Schedule tests with authorities having jurisdiction and with Architect/Engineer, Purchaser, and Contractor present. A minimum notice of 48 hours shall be required prior to all testing.

4. Test the elevator systems with the contractor installing the Heat Detector and Smoke Detector System and Flow Control Switches to ensure that elevators are recalled and shutdown prior to application of water by machine room and hoistway level sprinkler systems. Document test results.

5. Acceptance testing for the passenger elevators shall be in accordance with applicable requirements of ASME A17.1 and ASME A17.2 procedures in Elevator Inspector's Manual and related codes listed in Section 1.3 of this Division.

B. Inspection

1. Schedule acceptance tests with a Qualified Elevator Inspector (QEI).

2. Follow procedures in ASME A17.2.1 Inspector's Manual for Traction elevators.

C. New Installation Service (NIS)

1. Begin NIS upon Purchaser acceptance of final elevator and continue until one year after completion of the elevator or whatever period is required for extended maintenance, if longer than one year.

2. Interim maintenance service shall be provided on all units until start of new work and on units in service until completion of the new work, i.e. if two units are in service and two units are under construction, then interim maintenance service shall be only on units that are in service to the public until completion of the new work on all elevators.

3. Obtain from the Manufacturer and furnish to the Purchaser all data affecting the elevator modification, including "AS-INSTALLED" circuit and control wiring diagrams and maintenance manuals. Submit full-service maintenance proposal containing services, obligations, conditions and terms for agreement period and for future renewable options.

D. Performance Test

Demonstrate to Purchaser or Purchaser's designated representative the operation of the elevator system. Demonstration shall include:

1. Installation compliance with specifications.
2. Contract speed, capacity, and floor-to-floor performance compliance with specifications. For traction elevators, speed to be within 3% of rated speed in the up direction and in the down direction under any load.
3. Stopping accuracy and car ride compliance with specifications.
4. Operation of signal fixtures, operation of supervisory or dispatching system and fireman's service operation.
5. Promptly remove all work rejected by the A/E for failure to meet specifications and replace to comply with requirements at no additional cost to Purchaser. All expenses of repairing work of other Trades damaged by this replacement shall be borne by the Contractor.
6. Rejected work which is not made good within a reasonable time, determined by the A/E, may be corrected by the Purchaser at Contractor's expense.
7. Upon completion of installation and before final acceptance, conduct a running speed test with full design load to verify compliance with performance requirements including Items 2 and 3.
8. Operating Instructions: Provide instructions to the Purchaser personnel, including safety procedures, proper operation of the equipment, routine maintenance procedures and Maintenance Control Plan.
9. Provide four (4) sets of labeled keys per elevator for each unique key or key switch.
10. Door opening and closing time: Adjustable (set for 3 ft/sec for opening and 1 ft/sec for closing).
11. Door dwell times: Minimum as allowed by ADA.
12. If deficiencies are found, or if the consultant/ Purchaser deems it necessary the contractor shall perform the following tests at no additional charge immediately following the final inspection.
    a. Test Period: The elevators shall be subjected to a test for a period of one-hour continuous run, with full specified load in the car. During the test run, the car shall be stopped at all floors in both directions of travel for a standing period of 10 seconds per floor.

b. Speed Load Tests: The actual speed of the elevator car shall be determined in both directions of travel with full contract load and with no load in the elevator car. Speed shall be determined by tachometer. The actual measure speed of the elevator car with full load shall be within 10 percent of rates speed. The maximum different in actual measure speeds obtained under the various conditions outlined between the "UP" and the "DOWN" directions shall be checked.

c. Floor-to-Floor times with no load in the car, balanced load and full car load shall be checked.

d. Car Leveling tests: Elevator car leveling devices shall be tested for accuracy of landing at all floors with no load in the car, balanced load in the car, and with full load in the car, in both directions of travel. Accuracy of floor landing (+/- ¼-inch) shall be determined both before and after the full-load run test.

e. Insulation Resistance Tests: The complete wiring systems of the elevators shall be free from short circuits and grounds, and the insulation resistance shall be determined by use of a "Megger." Conductors shall have an insulation resistance of not less than one megohm between conductor and ground and between each conductor and all other conductors.

f. Reinspection: If any equipment is found to be damaged or defective, or if the performance of the elevator does not conform with the requirement of the contract specifications or the Safety Code, no approval or acceptance of elevators shall be issued until all defects have been corrected. When the repairs and adjustments have been completed and the discrepancies corrected, the consultant shall be notified and the elevator will be reinspected. Rejected elevator shall not be used until they have been reinspected and approved.

## 3.6 CLEANING, PAINTING, AND ADJUSTING

A. Adequately protect surfaces against accumulation of paint, mortar, mastic and disfiguration or discoloration and damage during shipment and installation.

B. Final Cleaning

1. At the completion of the work, the Contractor shall remove from the project site all tools, surplus materials, equipment, scrap debris, waste, temporary facilities, protection and barricades. All building surfaces within the construction area shall be thoroughly cleaned and have it free from discoloration, scratches, dents and other surface defects

C. The finished installation shall be free of defects. Before final completion and acceptance of the building, repair and/or replace defective work, to the satisfaction of the Architect and the Purchaser at no additional cost.

D. All equipment shall be adjusted prior to final testing and acceptance.

E. Paint exposed work soiled or damaged during installation. Repair to match adjoining work prior to final acceptances. At a minimum all hoistway and machine room components shall be painted in the field with at least one coast of machine grade enamel. Elevator machine room walls shall be painted. Machine room floors shall be painted. Pit floors shall be painted. The intent is to provide a complete final product that is neat, clean and painted.

F. Contractor shall clean and paint the machine room walls and floor with a paint as selected by the Architect

3.7 DEMONSTRATION

A. Demonstrate to Purchaser Representative that all systems specified are operating correctly and provide 4 hours training on use of systems. On-site technical training shall be held for the purpose of familiarizing employees with operations and troubleshooting procedures. At a minimum training shall include operation of elevators under emergency conditions, operations and maintenance of fire alarm and fire recall systems, operation of elevator communications, electronic door reversal devices, etc.

END OF SECTION 142123.13

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# SECTION 210500
# COMMON WORK RESULTS FOR FIRE SUPPRESSION

## PART 1 GENERAL

### 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
   1. For all aspects of fire suppression, where conflicts or inconsistencies occur among codes, standards, the specifications and/or the drawings the contractor shall bid and execute the more stringent requirement.

### 1.02 SUMMARY

A. This Section includes the following:
   1. Piping materials and installation instructions common to most piping systems.
   2. Escutcheons.
   3. Firestop Mortar
   4. Grout.
   5. Fire-suppression piping demolition.
   6. Supports and anchorages.

B. All work called out on the construction documents and in the specifications shall be executed by the contractor. NFPA standards shall be followed as a minimum for fire suppression installation. Where the drawings, codes or specifications require work or documentation beyond the minimum standards or that required by the AHJ, the contractor shall provide that work.

C. The provisions called out in this specification section apply to all Division 21 specification section.

### 1.03 DEFINITIONS AND ABBREVIATIONS

A. Construction Management: Team comprised of construction manager, architect and engineer as applicable project who will carry out the tasks of project planning, design interpretation and construction in an integrated manner..

B. Exposed, Interior Installations: Exposed to view indoors. Examples include unfinished occupied spaces and mechanical equipment rooms.

C. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

D. Listed: Equipment, materials, or services included in a list published by a nationally recognized testing laboratory (UL or FM), that is acceptable to the authority having jurisdiction and is concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for fire protection service.

E. NFPA: National Fire Protection Association.

F. NRTL: Nationally (United-States-based) Recognized Testing Laboratory. An independent third-party organization recognized by the Occupational Safety & Health Administration (OSHA) to provide evaluation, testing and certification of products. Products shall be evaluated for use in fire protection systems. For purposes of fire protection with few exceptions only UL and FM shall be acceptable.

G. Standard Weight: Where used throughout the documents to designate pipe wall thickness, “standard weight” shall be considered synonymous with schedule 40 pipe.

### 1.04 SUBMITTALS

A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Escutcheons.

B. Welding certificates.

C. Firestopping system drawing listed or approved by a nationally recognized testing laboratory.

D. Submit all product data, calculations and shop drawings as required in this and other Division 21 specifications and the design drawings. The engineer will review and return submittals inside and average of ten calendar days from receipt of them.
   1. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities; all of which remain the responsibility of the Contractor.
   2. Engineer review is for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

E. Informational Submittals
   1. For all Fire Protection Systems (Sprinkler systems) submit Shop Drawings and, if pipe sizes are changed or pipe is significantly rerouted, Hydraulic Calculations:
      a. Include plans, elevations, sections, details, and attachments to other work.
      b. Provide signed and sealed Shop Drawings and Hydraulic Calculations when calculations are required.
      c. In addition to any other provisions for submittals in the contract, provide shop drawings and calculations with signature and seal of contractor's engineer for review and comment by the engineer of record.
   2. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   3. Drawings: Sprinkler and standpipe systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
      a. Fire protection piping and the associated drain piping.
      b. Domestic water piping.
      c. Compressed air piping.
      d. HVAC hydronic piping and ductwork.
      e. Items penetrating finished ceiling include the following:
         1) Lighting fixtures.
         2) Air outlets and inlets.
         3) Exit signs
         4) Fire alarm devices.

F. As-Built drawings. Provide:
      a. Redlines: Maintain hard copies with field changes marked up. Scan or photograph the redlines weekly and at project completion for project record.
      b. Electronic CAD files with clouded field changes.
      c. PDF's of the CAD files with clouds turned on.
      d. At completion of installation attach an amply sized metal documents box (like SAFETY TECHNOLOGY INTERNATIONAL's EM1212DOC SYSTEM RECORD DOCUMENTS box) to the wall adjacent to or behind sprinkler system riser(s) or in pump room. Paint box red and provide custom labeling. Place a full-size copy of the sprinkler shop drawings in the box along with a copy of the O&M manual.
         1) For installations that are limited in scope and have less documentation, place drawings with spiral bound O&M manual and use a box similar to KYODOLED Wall-Mount Large Capacity Galvanized Steel Rust-Proof Metal Box.
            (a) Minimum Size: 15" x 9" x 4".

2) Mark boxes with a custom, machine printed, Self-Adhesive Pipe Label (white lettering on red background) that reads “Fire Protection System Documents. See 210500.

**1.05 WARRANTY**

A. Special Warranty: Manufacturer agrees to repair or replace fire-suppression system equipment and components that fail in materials or workmanship within specified warranty period.

B. Warranty Extent:
   1. All equipment, components, labor to replace or repair.
   2. Repair of collateral damage due to failure (e.g.: water damage or repair to finishes damaged to access location of repair).

C. Warranty Period: 2 years from date of final acceptance of installation.

**1.06 QUALITY ASSURANCE**

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Installation shall conform to any referenced standards or codes except as directed otherwise in writing by the authority having jurisdiction or the owner’s insurance underwriter. It is the contractor’s responsibility to procure any codes or standards required for conformity.
   1. Comply with all state adopted amendments to NFPA 13.
   2. The contractor shall employ sprinkler installers/pipe fitters who are versed in provisions of relevant NFPA standards and the building code and who shall make field modifications as needed so the installation is compliant with the standards.
   3. Contact the owner’s insurance underwriter and the local AHJ to ascertain any requirements that exceed or limit the provisions of the state adopted version of NFPA 13. Comply with any such additional limitations that are more stringent than the requirements of NFPA 13.
   4. All Fire Protection Equipment shall be listed.

**1.07 DELIVERY, STORAGE, AND HANDLING**

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

**1.08 COORDINATION**

A. Sprinkler installation shall be fully coordinated with all building systems. The contractor shall employ sprinkler installers and pipe fitters who are versed in the provisions of codes and NFPA standards and who will recognize the need for field changes to what is shown on shop drawings so as to effect an installation that is in all respects compliant with codes and standards.

B. Plan pipe installation so that no pipe is run in dedicated electrical space over electrical equipment. Coordinate planning and installation with electrical contractor. Any pipe in dedicated electrical space shall be moved at the expense of the fire protection contractor.

C. Coordinate installation with work of other trades. Where conflicts between drawings exist the more stringent/costly requirement/installation shall be executed.

D. On renovation projects in buildings that will remain in use or partially occupied:

1. Provide a fire watch during times when any fire protection systems are taken out of service.
2. Operate valves to isolate and drain parts of systems on which work will be performed only after notifying the owner or owner's designated representative.
3. Return system to service at the end of each work period before terminating fire watch.
   a. Check the control valve(s) to verify protection is in service at the end of each work shift and send a communication by way of email to the owner or owner's representative indicating the system is verified as being in service.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

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

### 2.02 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

C. All fire suppression pipe, tube and fittings shall be listed for fire protection service by a nationally recognized testing agency.

### 2.03 JOINING MATERIALS

A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

B. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

### 2.04 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around rod or pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
   1. Finish: Polished chrome-plated and rough brass.

### 2.05 FIRESTOP MORTOR

A. Light-weight, fast drying portland cement based material.
   1. Suitable for troweling or pouring.
   2. Mortar shall be approved for a wide range of applications including combustible and noncombustible penetrants when used by itself or in combination with other products from the same manufacturer.
   3. When used for penetrations provide sketch of fire stop system that is approved or listed by a nationally recognized testing laboratory.

B. Passive (non-intumescent), non-shrinking material.
   1. Firestop mortar shall be UL Classified and/or FM Systems Approved and tested to the requirements of ASTM E814 (UL1479).

### 2.06 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

**2.07 PIPE LABELS**

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. E.g.: “Fire Protection,” “Sprinkler,” “Dry Pipe System,” etc.
   2. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
   3. Lettering Size: At least 1/2 inch high for pipe 1-1/4” and smaller; at least ¾” inch high for pipe 1-1/2” and 2”; at least 1-1/4” high for 2.5 to 6”.

**2.08 PAINT**

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on subject substrate.

B. Primers:
   1. Alkyd Anticorrosive Metal Primer: MPI #79.
   2. Quick-Drying Alkyd Metal Primer: MPI #76.
   3. Galvanized, Water Based Primer: MPI #134.
   4. Acrylic Primer/Finish: 100% acrylic emulsion, waterborne, corrosion resistant coating.

C. Paint
   1. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).
   2. Exterior Alkyd Enamel (Gloss): MPI #9 (Gloss Level 6).
   3. Acrylic Primer/Finish: 100% acrylic emulsion, waterborne, corrosion resistant coating.

D. Finish: Gloss or Semi-gloss.

E. Corrosion Inhibiting Coating
   1. Zinc-rich paints meeting ASTM A 780 specifications.
   2. Solvent-based Galvanizing Compound Primer.
   3. The dried film shall contain 65% or greater zinc dust by weight.
   4. Color: gray or metallic silver mimicking the color of galvanized pipe.

**PART 3 EXECUTION**

**3.01 GENERAL**

A. The fire protection contractor shall obtain and pay for all:
   1. Permits
   2. Government fees
   3. Plan reviews
   4. Inspection fees
   5. Other regulatory fees similar to the above to facilitate construction.

B. On-site documents:
   1. Maintain on site a copy of shop drawings for all Division 210000 fire protection systems. The shop drawings shall be marked up (red-lined) daily to record changes that are made due to field adjustments to suit the actual project conditions and resulting from

coordination with the work of other trades. Scan or photograph the red-lined set of drawings at a minimum monthly to ensure no loss of the recorded field changes that will be used for generation of close-out as-built documentation.

**3.02 FIRE-SUPPRESSION DEMOLITION**

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove fire-suppression systems, equipment, and components indicated to be removed.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

**3.03 PIPING SYSTEMS - COMMON REQUIREMENTS**

A. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

B. Install piping so that no pipe is run in dedicated electrical space over electrical equipment.
   1. No pipe shall be installed above electrical panelboards and/or switchboards in the dedicated electrical space. The dedicated electrical space shall extend from the footprint of the electrical panelboard or switchboard from the floor to the lower of a height of 6 feet above the height of the equipment or to the structural ceiling above the equipment. For purposes of this coordination, the electrical drawings shall be considered part of the fire protection contract. Installation shall be coordinated in cooperation with the electrical contractor with actual field conditions dictated by the final location of the electrical equipment. Where it is necessary to install pipe above the dedicated electrical space obtain approval in writing for each specific case and from the authority having jurisdiction and install a drip pan over the dedicated space below the pipe. Under no circumstances shall pipe be installed in the dedicated electrical space.

C. Install piping to permit valve servicing.

D. Install wet pipe system piping level and plumb.

E. Install piping free of sags and bends.

F. Install fittings for changes in direction and branch connections.

G. Select system components with pressure rating equal to or greater than system operating pressure.

H. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
   1. New Piping:
      a. Bare Piping in Unfinished Service Spaces: One-piece galvanized, cast-iron or malleable iron wall or ceiling plate.
   2. Existing Piping: Use the following:
      a. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type.

I. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

J. For non-sleeved, non-rated wall, partition, floor and ceiling penetrations in concealed locations, fill space with non-combustible mineral wool and caulk with acoustical sealant to mitigate sound transmission.

K. Verify final equipment locations for roughing-in.

L. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

**3.04 FIRESTOPPING**

A. In addition to all directives in this specification, comply with any additional requirements of Section 078413.

B. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

D. Use firestop mortar to patch abandoned holes through fire-rated partitions, walls and barriers as the result of pipe demolition.
   1. Where forming is required, plywood or foam insulation boards may be used. In smaller openings, mineral fiber, backer rod (#3 rebar) or other suitable materials may be used.
      a. Adequately support all forming material to support the wet weight of the mortar. Remove any combustible forming materials after mortar sets.
      b. Recess forming material to a depth which allows for the proper depth of fill material.
   2. Expanded metal lath shall be acceptable as a permanent form and to add reinforcement in larger openings. Mix mortar to a stiff consistency to prevent seepage.

E. Install fill materials for firestopping by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

F. Identification
   1. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
      a. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
      b. Contractor's name, address, and phone number.
      c. Designation of applicable testing and inspecting agency.
      d. Date of installation.
      e. Manufacturer's name.
      f. Installer's name.

G. Cleaning and protection
   1. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
   2. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

**3.05 PIPING JOINT CONSTRUCTION**

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
   3. Minimum pipe wall thickness for threaded pipe shall be schedule 40.
   4. For pipe run on the building exterior or in damp locations, apply a corrosion inhibiting coating to the exposed cut threads. Surfaces to be reconditioned with zinc-rich paint shall be clean, dry, and free of oil, grease, and corrosion products.

E. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Grooved joints:
   1. Use only listed fittings and couplings.
   2. Roll groove black steel pipe only. Utilize roll-grooving tool on power drive or manual roll groover. Comply with recommendations in the grooving machine (tool) manual, roll set instructions and the manufacturer of the listed coupling to be used. Do not roll groove galvanized steel pipe.
   3. Cut grooves in black or galvanized steel pipe using a cut groove die head on power drive/threading machine. Removing metal from the outside surface of the pipe to create the groove. Cut groove depth shall be no greater than Standard Cut Groove Steel Pipe Specifications from the fitting manufacturer. Minimum pipe wall thickness for cut grooving methods shall be schedule 40.

**3.06 PAINTING**

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
   1. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
      a. Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion
   2. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   3. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.
   4. Do not apply alkyds directly over unprimed galvanized surfaces.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.
   2. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

C. Apply paints to all exposed pipe and fittings according to manufacturer's written instructions.
   1. Exceptions:
      a. Do not paint galvanized pipe and fittings except at exterior terminations of drain pipe.
   2. All sprinkler pipe in elevator machine rooms shall be labeled or painted fire engine red (or manufacturer’s equivalent) unless otherwise directed by architect.
   3. If project requires restricted application method (e.g., using only spray or rollers), revise first subparagraph below accordingly.
   4. Mask stenciled manufacturers’ labels on pipe before painting and remove masking after paint application.
   5. Use applicators and techniques suited for paint and substrate indicated.

6. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
7. Alkyd System: MPI EXT 5.1D.
   a. Prime Coat: Alkyd anticorrosive metal primer.
   b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
   c. Topcoat: Exterior alkyd enamel semigloss or gloss.
8. Acrylic Primer/Finish used as prime coat and topcoat.
   a. Application Temperature Range: 50°F minimum, 131°F maximum (air surface and material); At least 5°F (2.8°C) above dew point.

D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

E. Prep and prime all pipe, including concealed pipe, where welded fittings are used:
   1. Coat with corrosion inhibiting/converting coating or use Alkyd System: MPI EXT 5.1D as described above.

F. Additional painting of fire-suppression systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

**3.07 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

B. Field Welding: Comply with AWS D1.1.

**3.08 GROUTING**

A. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

**3.09 PIPE LABEL INSTALLATION**

A. Provide pipe labels on sprinkler pipe in work scope spaces for pipe that is not painted red.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for armovers (drops). Where flow pattern is not obvious, mark each pipe at branch.
   3. At least one pipe level shall be on sprinkler pipe in each room where pipe is exposed. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Pipe labels shall be neatly applied and align parallel to the run of the pipe.
   6. Pipe labels on overhead pipe shall be placed on the bottom of the pipe for maximum visibility.
   7. Near major equipment items and other points of origination and termination.
   8. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

C. Pipe Label Color Schedule:
   1. Fire Suppression Water Piping:
      a. Background Color: Red.
      b. Letter Color: White.

**END OF SECTION**

# SECTION 211313
# WET-PIPE SPRINKLER SYSTEMS

## PART 1 GENERAL

### 1.01 RELATED DOCUMENTS

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

### 1.02 SUMMARY

A. Section Includes:
   1. Pipes, fittings, and specialties.
   2. Sprinklers.

### 1.03 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

B. FSPC: Fire suppression piping contractor; sprinkler contractor; fire protection contractor.

C. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

### 1.04 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
   1. Any pipe or sprinkler layouts shown on the drawings is conceptual to define the scope and limits of the work. Alternately sprinkler layouts of existing systems approximate the locations of pipe and sprinklers based on rough estimates of visually obtained data without the use of measuring devices. The contractor shall determine actual pipe routing and sprinkler layouts and quantities as part of their delegated design responsibility.
   2. Examine the drawings of all trades and survey the site comprehensively to determine the locations of all sprinklers including those needed to mitigate obstructions.

C. Sprinkler system design shall be approved by authorities having jurisdiction.
   1. While the building may have an overall hazard classification, individual rooms shall employ a sprinkler layout and a water delivery density appropriate to their individual hazard classifications or storage configurations.
   2. Sprinkler Occupancy Hazard Classifications:
      a. Elevator machine rooms and hoistways: Ordinary Hazard, Group 1.
      b. Building Service Areas: Ordinary Hazard, Group 1.
      c. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
      d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
   3. Minimum Density for Automatic-Sprinkler Piping Design:
      a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
      b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
   4. Maximum Protection Area per Sprinkler: Per UL listing.
   5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
      a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
      b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

### 1.05 SUBMITTALS

A. Action Submittals:

1. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations.
3. Welding certificates.

B. Closeout Submittals
1. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
2. Field quality-control reports.
3. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals. Spiral bound with polypropylene presentation cover and labeled.
4. See as-built requirements in 210500.

## 1.06 QUALITY ASSURANCE

A. Installer Qualifications:
1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
   a. Engineering Responsibility: Preparation of working plans (shop drawings), calculations, and field test reports by a qualified professional engineer in the service of the fire protection contractor.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
1. NFPA 13, "Installation of Sprinkler Systems."

## 1.07 PROJECT CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
1. Notify Construction Manager no fewer than two days in advance of proposed interruption of fire protection water service.
2. Do not proceed with interruption of sprinkler service without Construction Manager's written permission.

## 1.08 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that are mounted on or near ceilings, including light fixtures, HVAC equipment, and partition assemblies, electrical bus duct and structural members.

B. Unless otherwise indicated, Fire Suppression Piping Contractor (Fire Protection / Sprinkler Contractor) shall be responsible for:
1. all above ground fire suppression piping,
2. fire suppression water service piping inside the building and within a five foot perimeter outside the building and shall

C. FSPC shall coordinate with the site contractor and plumbing contractor to make final connections to site utility (fire suppression water service) piping.

D. Coordinate with the contractor installing the fire alarm system for connection of all supervisory and alarm devices associated with the building’s fire protection systems to the fire alarm system. Provide one set of shop drawings to the fire alarm contractor.

## 1.09 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Include number of sprinklers required by NFPA 13 and sprinkler wrench.
      a. Provide a minimum of 2 spare sprinklers of each type and temperature rating.
      b. The low number of new sprinklers required for attic stock assumes there is already a full complement of sprinklers in a spare sprinkler cabinet on premiss
   2. Post in the sprinkler cabinet a tabular list of the sprinklers installed in the property. Include on the list:
      a. Sprinkler identification Number and manufacturer, model, orifice, deflector type, thermal sensitivity, and pressure rating.
      b. General description.
      c. Quantity of each type to be contained in the cabinet.
      d. Issue or revision date of the list.

# PART 2 PRODUCTS

## 2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

B. All materials shall be UL Listed or FM Approved for Fire Service.

## 2.02 STEEL PIPE AND FITTINGS

A. All galvanized pipe shall be hot dipped type, internally and externally galvanized and suitable for use in FM approved dry pipe systems.

B. Standard Weight, Galvanized- and Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

C. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.

D. Galvanized- and Black Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

E. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.

F. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

G. Malleable- or Ductile-Iron Unions: UL 860.

H. Cast-Iron Flanges: ASME 16.1, Class 125.

I. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

J. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

K. Grooved-Joint, Steel-Pipe Appurtenances:
   1. Pressure Rating: 175 psig minimum.
   2. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
   3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

## 2.03 LISTED FIRE-PROTECTION VALVES

A. General Requirements:
   1. Valves shall be UL listed or FM approved.
   2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.

B. Ball Valves:

1. Standard: UL 1091 except with ball instead of disc.
2. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
3. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
4. Valves NPS 3: Ductile-iron body with grooved ends.

**2.04 TRIM AND DRAIN VALVES**

A. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.

B. Ball Valves

**2.05 SPECIALTY VALVES**

A. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:
   a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Threaded or grooved.

B. Automatic Air Vent:
1. Available Manufacturers:
   a. AGF Manufacturing, Inc.
   b. Potter Electric Signal Company, LLC
2. FM Approved and/or UL Listed.
3. Forged brass body with 1” NPT isolation valve.
4. Stainless Steel 20 mesh strainer.
5. Adjustable purge valve with hose connection, thread cap, and lanyard.
6. Recessed venting valve.
7. Single float on rigid shaft.
8. Bubble Breaker aids.

**2.06 SPRINKLER SPECIALTY PIPE FITTINGS**

A. Branch Outlet Fittings:
1. Standard: UL 213.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-T and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, plain-end pipe, or threaded.
8. Inlet and Outlet: Threaded.

**2.07 SPRINKLERS**

A. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

B. Automatic Sprinklers with Heat-Responsive Element:
1. Nonresidential Applications: UL 199.
2. Characteristics:

a. Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6 or 8.0.
b. "Intermediate" temperature classification rating unless otherwise indicated or otherwise required by the AHJ, local ordinances (code), insurance underwriter or application.

C. Sprinkler Finishes:
1. Bronze.

D. Sprinkler Guards:
1. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

**2.08 HANGERS AND SUPPORT**

A. Hangers and components of hanger assemblies that attach directly to pipe or to the building structure shall be listed. All materials shall comply with NFPA 13.
1. Provide surge restraint hardware listed for use with selected hangers.

B. Floor mounted pipe supports
1. Comply with NFPA 13 standards or
2. Stanchion type adjustable pipe saddle support with yoke meeting Federal Specifications A-A-1192A (Type 38) and WW-H-171E (Type 39), and MSS SP-69 (Type 38) on a single length of threaded schedule 40 pipe attached to a malleable iron flange base.
3. The size of the threaded schedule 40 pipe used for pipe stands shall match that listed in NFPA 13 based on the supported pipe size, pipe stand height, and the distance between pipe supports. Nominal diameter for pipe used for pipe stands shall be no less than:
a. 1-1/2” for pipe 2-1/2” and smaller
b. 2” for 3” pipe
c. 4” for 4” pipe and larger.

**PART 3 EXECUTION**

**3.01 PIPING INSTALLATION**

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of some but not all piping. Install piping as indicated, as far as practical, but fully coordinated with the work of other trades.
1. Deviations from submitted shop drawings for piping require written approval from the architect. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. In elevator machine rooms or rooms housing elevator controllers, pipe shall be moved so that all pipe, fittings and sprinklers are at or above 84 inches above the finished floor.

E. The size of fitting outlets on branch pipe and pipe run out to sprinklers shall be no less than 1-inch and a reducing fitting shall be used to meet the thread size of the sprinkler. The 1 inch fitting outlet requirement shall apply to return bends, arm-overs and sprinklers mounted on exposed branch pipe.

F. Provide a single automatic air vent at the high point of the wet pipe piping in the elevator machine room in the upper penthouse. Tap the branch or main pipe off the top of the pipe to maximize the amount of air vented.
1. Place the vent in an easily accessible location of the system.
2. Provide a ball valve (same size as air vent) to isolate the air vent during service and maintenance without shutting down the FP system. Leave ball valve open.

G. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

H. Fabricate and install pipe so that manufacturers' stenciled pipe labels are oriented down and can be readily seen by inspectors during construction.

I. Install unions adjacent to each valve in pipes NPS 2 and smaller.

J. All pipes shall be routed so as not to occupy the dedicated electrical space above electrical panels and shall be dedicated to only the elevator space. Common piping shall not pass through or over these rooms.

K. Install sprinkler piping with drains for complete system drainage.

L. Install hangers and supports for sprinkler system piping according to NFPA 13.
   1. Comply with requirements for hanger installation spacing in NFPA 13.
   2. Floor mounted pipe support installation and spacing shall comply with the requirements for pipe stands in NFPA 13 (latest edition).
   3. Show locations of each hanger on the shop drawings.
   4. Provide Vertical Restraint on pipe as required by code or as recommended by pipe manufacturer.

M. Fill sprinkler system(s) piping with water. Fill system(s) slowly to allow maximum air to migrate to and escape from automatic air vent(s).

**3.02 SPRINKLER INSTALLATION**

A. Install horizontal sidewall sprinkler(s) within two feet of the bottom of elevator hoistway pits.

B. Where ceilings are supported by solid structural members effecting 'obstructed construction,' layout and install sprinklers so the distance from deflectors to the ceiling is no greater than 22 inches when steel members are 21 inches or less in depth. Where solid structural members are greater than 21 inches in depth, install sprinklers in the center of each beam pocket within 12 inches of the ceiling.

C. Install sprinklers with consideration to obstructions and changes in ceiling elevation.
   1. Where space below soffits cannot be adequately covered by sprinklers from the higher adjacent ceiling provide sprinklers in the soffits.

**3.03 IDENTIFICATION**

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Consult 210500.

**3.04 FIELD QUALITY CONTROL**

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
      a. It shall be acceptable to perform pneumatic leak test at 80 psi before hydrostatic test to ensure pipe integrity before introduction of water.
      b. Perform hydrostatic leak test to be performed at the highest anticipated working pressure of the system.
         1) Vent as much air from system as is practicable while bringing the system up to working pressure using the automatic supply from the utility or fire pump.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
   4. Energize circuits to electrical equipment and devices.
   5. Coordinate with fire-alarm tests. Operate as required.
      a. Test each flow switch by water flow through its test fitting.
   6. Coordinate with fire-pump tests. Operate as required.

7. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

**3.05 CLEANING**

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

**3.06 DEMONSTRATION**

A. Advise the Owner of the importance of retaining the as built fire protection documents for future system modification design.

**3.07 PIPING SCHEDULE**

A. All drain pipe shall be galvanized.

B. Sprinkler specialty fittings may be used, downstream of control vales, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, shall be one of the following:
   1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
   2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
   3. Standard-weight, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
   4. Standard-weight, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
   5. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.
   6. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
   7. Schedule 10 black-steel pipe with plain ends; welding fittings; and welded joints.

**3.08 SPRINKLER SCHEDULE**

A. Use sprinkler types in subparagraphs below for the following applications:
   1. Rooms without Ceilings: Upright or pendent sprinklers.
   2. Wall Mounting and bottom of elevator hoistways: Sidewall sprinklers.
   3. Spaces Subject to Freezing:
      a. There should be no spaces subject to freezing. If the contractor encounters such a space, report it to the Architect.
   4. Provide sprinklers with temperature ratings appropriate to the space being protected. Default temperature rating shall be intermediate temperature. Coordinate use of sprinklers other than intermediate temperature rating with heat sources per NFPA 13 requirements. Highlight prominently on shop drawings all sprinklers with temperature ratings other than intermediate temperature and the reason for the variation. All sprinklers with temperature ratings higher than intermediate temperature shall be subject to the approval of the authority having jurisdiction including those in:
      a. Elevator Machine Room: Provide sprinklers with an intermediate temperature rating.
      b. Rooms with Unit Heaters: Provide sprinklers with a high temperature rating.

B. Provide sprinkler types in subparagraphs below with finishes indicated.
   1. Upright, Pendent and Sidewall Sprinklers: Rough bronze in unfinished spaces not exposed to view.

C. Provide listed sprinkler guards in the following locations:
   1. Sprinklers installed less than 7 feet above the floor,
   2. Sprinklers installed within elevator machine rooms, hoistways and elevator pits,

**END OF SECTION**

# SECTION 220513
# COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Single phase electric motors.

### 1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

### 1.03 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015 (Reaffirmed 2020).

B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2017.

C. NEMA MG 00001 - Motors and Generators; 2024.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

### 1.04 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of high efficiency motors.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

### 1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

## PART 2 PRODUCTS

### 2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 260583 for required electrical characteristics.

B. Electrical Service:
   1. Motors 1 HP and Smaller: 208 volts, single phase, 60 Hz.

C. Construction:
   1. Design for continuous operation in 104 degrees F (40 degrees C) environment.
   2. Design for temperature rise in accordance with NEMA MG 00001 limits for insulation class, service factor, and motor enclosure type.

D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

E. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

**END OF SECTION**

# SECTION 220529
# HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Strut systems for pipe or equipment support.

B. Pipe hangers.

C. Pipe supports, guides, shields, and saddles.

D. Anchors and fasteners.

### 1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications.

### 1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

D. 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; 2025.

E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

F. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

G. UL (DIR) - Online Certifications Directory; Current Edition.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

### 1.05 QUALITY ASSURANCE

A. Comply with applicable building code.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Materials for Metal Fabricated Supports: Comply with Section 055000.

1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

**2.02 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT**

A. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.

**2.03 PIPE HANGERS**

A. Band Hangers, Adjustable:
1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

B. Clevis Hangers, Adjustable:
1. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
2. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

**2.04 PIPE CLAMPS**

A. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

**2.05 ANCHORS AND FASTENERS**

A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

D. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
1. Channel Material: Use galvanized steel.
2. Manufacturer: Same as manufacturer of metal strut channel framing system.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

E. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

F. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

G. Secure fasteners according to manufacturer's recommended torque settings.

H. Remove temporary supports.

**3.03 FIELD QUALITY CONTROL**

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

# SECTION 220553
# IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

### 1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Identification painting.

### 1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

## PART 2 PRODUCTS

### 2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:
   1. Control panels, transducers, and other related control equipment products.
   2. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:
   1. Piping: 3/4 inch (20 mm) diameter and smaller.

C. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

### 2.02 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch (6 mm).

### 2.03 TAGS

A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch (40 mm) in diameter.

B. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

C. Piping: 3/4 inch (20 mm) diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

### 2.04 PIPE MARKERS

A. Comply with ASME A13.1.

B. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

C. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Identification Scheme, ASME A13.1:
   1. Primary: External Pipe Diameter, Uninsulated or Insulated.
   2. Secondary: Color scheme per fluid service.
      a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

## 3.02 INSTALLATION

A. Install tags in clear view and align with axis of piping

B. Install plastic pipe markers in accordance with manufacturer's instructions.

C. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

D. Apply ASME A13.1 Pipe Marking Rules:
   1. Place pipe marker adjacent to changes in direction.
   2. Place pipe marker adjacent each valve port and flange end.
   3. Place pipe marker at both sides of floor and wall penetrations.
   4. Place pipe marker every 25 to 50 feet (7.6 to 15.2 m) interval of straight run.

**END OF SECTION**

# SECTION 221429
# SUMP PUMPS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Submersible sump pumps.

### 1.02 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL (DIR) - Online Certifications Directory; Current Edition.

### 1.03 SUBMITTALS

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

B. Product Data: Provide certified pump chart or curve with duty point marked over.

C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

### 1.04 QUALITY ASSURANCE

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

B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

### 1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for pumps and related components. Complete forms in Owner's name and register with manufacturer.

## PART 2 PRODUCTS

### 2.01 SUBMERSIBLE SUMP PUMPS

A. Manufacturers:
   1. Stancor Corporation: SE-50, SE-100.
   2. Substitutions: See Section 016000 - Product Requirements.

B. General: Rugged stainless steel and cast iron housing and base with oil-filled motor chamber, ball bearings, and mechanical seal.

C. Impeller: Thermoplastic; open nonclog, stainless steel shaft.

D. Motor: Base mount, enclosed, lubricated oil-free, thermal-overload protected, continuous duty, permanent split capacitor with oil-resistant, three-prong connector, 10 foot (3 m) power cord.

E. Controls: Integral, chemically-resistant, vertical plated-steel rod float switch. Cycle pump Off/On between 2.5 and 9 inch (5.1 and 22.9 cm) heights from bottom of pump.

F. Solids Handling Capacity: Pass lint and other small solids up to 1/2 inch (15 mm) in size.

G. Discharge Pipe Size: 2 inch (50 mm, DN), NPT, female.

H. Accessories: Provide full flow swing-type discharge check valve.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install products with related fittings and accessories according to manufacturer instructions.

B. Observe and provide incidentals required to complete installation in compliance with ICC (IPC).

### 3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Operational Tests: Conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

### 3.03 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

### 3.04 PROTECTION

A. Protect installed products from damage from subsequent construction operations.

**END OF SECTION**

# SECTION 230513
# COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

## PART 2 PRODUCTS

### 1.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 260583 for required electrical characteristics.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

## PART 3 EXECUTION

### 2.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

**END OF SECTION**

# SECTION 230553
# IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

### 1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Identification painting.

### 1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

## PART 2 PRODUCTS

### 2.01 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch (6 mm).

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

### 2.02 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

### 2.03 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 099123 for stencil painting.

### 3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.

3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

**END OF SECTION**

# SECTION 230719
# HVAC PIPING INSULATION

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

C. Jacketing and accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 232113 - Hydronic Piping: Placement of hangers and hanger inserts.

C. Section 232300 - Refrigerant Piping: Placement of inserts.

### 1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

### 1.04 SUBMITTALS

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

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

### 1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

## PART 2 PRODUCTS

### 2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

## 2.02 GLASS FIBER, RIGID

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 850 degrees F (454 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

## 2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 180 degrees F (82 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

## 2.04 JACKETING AND ACCESSORIES

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F (minus 18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 inch (0.25 mm).

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

## 3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Inserts and Shields:
   1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

G. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV-resistant finish for flexible elastomeric cellular insulation without jacketing.

## 3.03 SCHEDULE

A. Refrigeration Piping: 1" Thick Interior, 2" Thick Exterior

B. Condensate Piping: 1" Thick

**END OF SECTION**

# SECTION 232300
# REFRIGERANT PIPING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Flexible connections.

### 1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 230716 - HVAC Equipment Insulation.

C. Section 230719 - HVAC Piping Insulation.

### 1.03 REFERENCE STANDARDS

A. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2025).

B. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2024, with Addendum (2025).

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

D. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2024.

E. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.

F. ASME B31.9 - Building Services Piping; 2025.

G. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

H. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

I. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

K. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

### 1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

## PART 2 PRODUCTS

### 2.01 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure integrity of system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

## 2.02 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

B. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

## 2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8-inch (22 mm) OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
   1. Fittings: ASME B16.26 cast copper.
   2. Joints: Flared.

C. Preinsulated Refrigerant Piping Linesets:
   1. Copper Tube: ASTM B280 seamless, anticorrosion pipe; lineset is precoupled to include two joined pipes.
   2. Insulation: Polyethelene closed-cell foam; preapplied to entire length of lineset. Weather- and UV-resistant for outdoor installation. Maximum flame spread index of 25 and maximum smoke developed index of 50, when tested in accordance with ASTM E84 or UL 723.

D. Pipe Supports and Anchors:
   1. Provide hangers and supports complying with MSS SP-58.
      a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   3. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
   4. Vertical Support: Steel riser clamp.
   5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   6. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   7. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## 2.04 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

B. Refrigerant: R-454B as defined in ASHRAE Std 34.

## 2.05 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

## 2.06 STRAINERS

A. Straight Line or Angle Line Type:
   1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi (2960 kPa).

## 2.07 FLEXIBLE CONNECTORS

A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches (230 mm) long with copper tube ends; for maximum working pressure of 500 psi (3450 kPa).

# PART 3 EXECUTION

## 3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

## 3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.5.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Insulate piping and equipment.

I. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

J. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

K. Fully charge completed system with refrigerant after testing.

## 3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Test refrigeration system in accordance with ASME B31.5.

C. Pressure test system with dry nitrogen to 200 psi (1380 kPa). Perform final tests at 27 inches (92 kPa) vacuum and 200 psi (1380 kPa) using halide torch. Test to no leakage.

**END OF SECTION**

# SECTION 238129
# VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Air-source outdoor units.

B. Refrigerant piping.

C. Indoor units.

D. Conduit and support for piping.

### 1.02 RELATED REQUIREMENTS

A. Section 230529 - Hangers and Supports for HVAC Piping and Equipment.

B. Section 230719 - HVAC Piping Insulation.

C. Section 232300 - Refrigerant Piping.

D. Section 284400 - Refrigerant Detection and Alarm.

E. Section 284400 - Refrigerant Detection and Alarm.

### 1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 1230 - Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment; 2021.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2025).

E. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2024, with Addendum (2025).

F. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. ITS (DIR) - Directory of Listed Products; Current Edition.

H. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

### 1.04 SUBMITTALS

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

B. Pre-Bid Submittals: For proposed substitute systems/products, as defined in PART 2, and alternate systems/products, as defined above, proposer shall submit all data described in this article, under the terms given for substitutions stated in PART 2.

C. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings indicated in Contract Documents:

D. Design Data:

1. Provide design data with respective calculations for respective climate zone in accordance with ASHRAE Std 90.1 I-P, ASHRAE Std 15, and ASHRAE Std 34.

E. Operating and Maintenance Data:

1. Manufacturer's complete standard instructions for each unit of equipment and control panel.

**1.05 QUALITY ASSURANCE**

A. Manufacturer Qualifications:
   1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.

B. Installer Qualifications: Trained and approved by manufacturer of equipment.

**1.06 DELIVERY, STORAGE AND HANDLING**

A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

**1.07 WARRANTY**

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Compressors: Provide manufacturer's warranty for 6 years from date of installation.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Mitsubishi Electric Trane HVAC US, LLC; _____: www.metahvac.com/#sle.

B. Substitutions: Systems designed and manufactured by other manufacturers will be considered by Owner under the terms described for substitutions with the following exceptions:
   1. Substitutions: See Section 016000 - Product Requirements.
   2. Substitution requests will be considered only if submitted data meets or exceed requirements listed in this section.

**2.02 VARIABLE REFRIGERANT FLOW SYSTEM**

A. Minimum System Requirements:
   1. System Testing, Capacity Rating, and Performance:
      a. AHRI 1230 when cooling capacity is equal or greater than 65,000 Btu/h (19 kWh).
      b. AHRI 210/240 when cooling capacity is below 65,000 Btu/h (19 kWh).
   2. Safety Certification: Bear UL 1995 tested and ITS (DIR) listed certification label.
   3. Outdoor Units: Furnish installation and surface support hardware products in accordance with ASCE 7 for wind restraint.

**2.03 AIR-SOURCE OUTDOOR UNITS**

A. Manufacturers:
   1. Heat Pump, Cooling or Heating Outdoor Units:
      a. Mitsubishi Electric Trane HVAC US, LLC; _____: www.metahvac.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Air Conditioning Type:
   1. DX refrigeration unit piped to one or more compatible indoor units either directly or indirectly through one or more intermediate refrigeration branch units.

C. Unit Cabinet:
   1. Capable of being installed with wiring and piping to the left, right, rear or bottom.
   2. Designed to allow side-by-side installation with minimum spacing and vibration isolation.
   3. Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.

D. Heat Sink Side:
   1. Condenser Fans:
      a. Provide minimum of 2 fans for each condenser within the outdoor unit.
      b. Minimum External Static Pressure: Factory set at 0.12 in-wc (30 Pa).

c. Fan Type: Vertical discharging, direct-driven propeller type with variable speed operation using DC-controlled ECM motors mechanically connected using permanently lubricated bearings having whole assembly protected with fan guards.

2. Condenser Coils:
   a. Hi-X seamless copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.

E. Refrigeration Side:
1. Factory assembled and wired with instrumentation, switches, and controller(s) to handle unit specifics with direct coordination of remote controller(s) from indoor unit(s).
2. Refrigeration Circuit: ECM driven dual scroll compressors, fans, condenser heat sink coil, expansion valves, solenoid valves, distribution headers, capillaries, filters, shutoff valves, oil separators, service ports, and refrigerant regulator.
3. Refrigerant: R-454B factory charged. Controller to alarm when charge is below capacity.
4. Variable Volume Control: Modulate compressed refrigerant capacity automatically to maintain constant suction and condensing pressures under varying refrigerant volume required to handle remote loads. Include defrost control.
5. Provide refrigerant subcooling to ensure the liquid refrigerant does not flash when supplying to use indoor units.
6. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle, oil return, or defrost is not permitted due to potential reduction in space temperature.
7. Power Failure Mode: Automatically restarts operation after power failure without loss of programmed settings.
8. Safety Devices: High pressure sensor with cut-out switch, low pressure sensor with cut-out switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, overcurrent protection for the inverter and antirecycling timers.
9. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.

F. Local Controls:
1. Include factory-wired instruments, sensors, switches, and safeties for unit control.
2. Include screen and button interface to setup operating schedules, setpoints, alarms, and remote unit setpoint coordination. Also used for system troubleshooting.

G. Power:
1. Electrical Requirement: 208 to 230 VAC, 3-phase, 60 Hz.
2. Outdoor Mounted: Provide fused NEMA EN 10250 Type 4X disconnect switch.

## 2.04 REFRIGERANT PIPING

A. Two-Pipe Run: Provide low-pressure vapor and high-pressure vapor gas pipes for each indoor unit selected for seasonal heating or cooling service.

B. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance; T-style joints are prohibited.

## 2.05 INDOOR UNITS

A. Minimum Unit Requirements:
1. DX Evaporator Coil:
   a. Copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
   b. 2-, 3-, or 4-row cross fin design with 14 to 17 fins per inch and flare end-connections.
   c. Provide thermistor on liquid and gas lines wired into local controller.
   d. Refrigerant circuits factory-charged with dehydrated air for field charging.
2. Fan Section:

a. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
b. Thermally protected, direct-drive motor with statically and dynamically balanced fan blades.
c. Minimum-adjustable external static pressure 0.32 in-wc (80 Pa); provide for mounting of field-installed ducts.

3. Local Unit Controls:
   a. Temperature Control: Return air control using thermistor tied to computerized Proportional-Integral-Derivative (PID) control of superheat.
   b. Temperature Zones:
      1) Single Indoor Unit: Set served space(s) as the local temperature zone.
      2) Multiple Indoor Units: For large zones, group and coordinate related indoor units with served spaces as the local temperature zone with each indoor unit as sub-zone.
4. Return Air Filter:
5. Condensate:
   a. Built-in condensate drain pan with PVC drain connection for drainage.
   b. Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.
   c. Units Without Built-In Condensate Pump: Provide built-in condensate float switch and wiring connections.
6. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.

B. Wall Mounted, Indoor Units:
1. Manufacturers:
   a. Mitsubishi Electric Trane HVAC US, LLC; _____: www.metahvac.com/#sle.
   b. Substitutions: See Section 016000 - Product Requirements.
2. DX coil, tubed drain pan, and built-in controls with thermostat remotely coordinated by outdoor air unit to maintain local air temperature setpoint.
3. Variable or three-speed ECM cross-flow fan with automatic airflow adjustment; external static pressure selectable during commissioning.
4. Return Air Filter: Manufacturer's standard.
5. Provide exposed unit casing with removable front grille; foamed polystyrene and polyethylene sound insulation; wall mounting plate; polystyrene condensate drain pan.
6. Airflow Control: Auto-swing louver that closes automatically when unit stops; five (5) steps of discharge angle, set using remote controller; upon restart, discharge angle defaults to same angle as previous operation.
7. Sound Pressure Range: Measured at low speed at 3.3 feet (1 m) below and away from unit.
8. Condensate Drain Connection: Side (end), not concealed in wall.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

B. Verify that condensate piping has been installed and is in the proper location prior to starting installation.

C. Notify Architect if conditions for installation are unsatisfactory.

### 3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions.

C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

D. Coordinate with installers of systems and equipment connecting to this system.

E. Refrigerant Piping: See Section 232300 with Section 230719 for insulation, and Section 230529 for hangers and supports unless following specific manufacturer recommendations.

F. Connect indoor units to condensate piping.

G. Install refrigerant leak detection and alarm system in occupied spaces; see Section 284400.

H. Provide refrigerant detection systems for units and piping; see Section 284400.

**3.03 FIELD QUALITY CONTROL**

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide manufacturer's field representative to inspect installation prior to startup.

**3.04 SYSTEM STARTUP**

A. Provide manufacturer's field representative to perform system startup.

B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C. Adjust equipment for proper operation within manufacturer's published tolerances.

**3.05 CLEANING**

A. Clean exposed components of dirt, finger marks, and other disfigurements.

**3.06 CLOSEOUT ACTIVITIES**

A. See Section 017800 - Closeout Submittals for additional submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

C. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.

**3.07 PROTECTION**

A. Protect installed components from subsequent construction operations.

B. Replace exposed components broken or otherwise damaged beyond repair.

**3.08 MAINTENANCE**

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

**END OF SECTION**

# SECTION 260000
# ELECTRICAL REQUIREMENTS

## PART 1 GENERAL

### 1.01 STIPULATIONS

A. The specifications sections, "General Conditions", "Supplementary General Conditions" and "Electrical Requirements" form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

### 1.02 GENERAL

A. All provisions of the "Instructions to Bidders", "Conditions of Contract", "General Conditions", "Special Conditions", Division 1 of "General Specifications" and applicable work in the "Electrical Requirements Section" govern work under the contract.

B. Provide all items, articles, materials, operations, or methods listed, mentioned or scheduled in the contract documents and/or specified herein, including all labor, materials, equipment and incidentals necessary and required for their completion. The complete installation as a whole shall be left ready for satisfactory operation.

### 1.03 SCOPE

A. Requirements specified herein shall govern applicable portions of the Electrical Work Sections; hereinafter referred to as Electrical Sections; whether so stated therein or not.

B. The Contractor shall lay out his own work and assume responsibility for all lines, elevations, inverts and measurements of work executed by him under the contract. He shall exercise every precaution to verify figures shown in the contract documents before laying out work and shall be responsible for any error resulting from his failure to exercise such precautions.

C. Where items specified in the Electrical Sections of the Specifications conflict with requirements in this section, the former shall govern.

### 1.04 REFERENCES

A. References to standards, codes, specifications or recommendations shall mean the latest edition of such publications adopted and published at date of invitation to submit proposals.

### 1.05 DEFINITIONS

A. Following definitions of terms and expressions used in the electrical sections are in addition to listing given in Supplementary General Conditions:
   1. "Provide" shall mean "furnish and install".
   2. "Herein" shall mean the contents of a particular section where this term appears.
   3. "Indicated" shall mean "indicated on contract drawings".
   4. "Section" shall mean one of the following portions of the Electrical Specifications.
   5. "Subsection" shall mean portions of Sections as listed under "Index" at the beginning of each Section.
   6. "Concealed" shall mean hidden from sight, as in trenches, chases, furred spaces, pipe shafts or hung ceilings.
   7. "Exposed" shall mean that they are not "Concealed" as defined herein above.
   8. "Conduit" includes in addition to conduit, also fittings, hangers, other accessories which comprise a system.
   9. "Electrician" shall mean the Contractor (or subcontractor) for Electrical Work.
   10. "Contractor" shall mean the Electrical Contractor (or subcontractor) for Electrical Work.
   11. "Singular Number". In all cases where a device or part of the equipment or system is herein referred to in the singular number it is intended that such reference shall apply to as many such items as are required to complete the installation.
   12. "Remove" shall mean "disconnect and remove".

### 1.06 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

## 1.07 DRAWINGS, INSTRUCTIONS

A. Contract drawings for electrical work are in part diagrammatic, and are intended to convey the scope of work and indicate general arrangement of equipment, conduits, approximate sizes and locations of equipment and outlets. The Contractor shall follow these drawings in laying out his work, shall consult general construction drawings to familiarize themselves with all conditions affecting their work, and shall verify spaces in which their work will be installed.

B. Where job conditions require reasonable changes such as indicated locations and/or equipment arrangement, such changes shall be made without extra cost to Government. This is not to be construed as to permit redesigning of the various systems.

C. Additional and supplementary drawings may, from time to time, be furnished and the same when made, are to constitute a part of the original contract. These drawings will be made to clarify the contract drawings and will not depart materially therefrom.

## 1.08 CODES AND ORDINANCES AND REGULATIONS

A. Nothing contained in the specifications or shown in the contract documents are intended to conflict with the codes, laws, ordinances, rules or regulations of Federal, State or Local Municipal Governmental Authorities having jurisdiction over the premises, the National Board of Fire Underwriters Inspection Agency and the Government's Insuring Agency. All such codes, laws, ordinances, rules and regulations are hereby incorporated and made a part of these specifications. Fixtures, appliances and equipment which are subject to UL tests shall bear such approval. All work performed on this project and all equipment furnished for this project shall be in conformance with the regulations and requirements of the Occupational Safety and Health Act (OSHA).

B. Should any change in the contract documents and/or specifications be required to conform to the codes, ordinances, regulations or laws mentioned above, the Architect/Engineer shall be notified prior to the time of submitting bids. After signing of the Contract, the Contractor will be responsible for the completion of all work necessary to meet the above mentioned requirements without additional expense to the Government.

C. Obtain and pay for all permits, inspections, test and certificates relating to his work as required by any of the foregoing Authorities. All certificates shall be delivered to the Architect/Engineer and become the property of the Government.

D. Upon completion of the work, furnish to the Engineers an Underwriter's Certificate of inspection indicating full approval of the work furnished and installed in the project.

E. Observe such rules and regulations as may be instituted by the Government, Architect/Engineer or their representatives affecting the conduct of employees, and the use and safeguarding of property.

## 1.09 LINES AND GRADES

A. The Contractor shall lay out his work and be responsible for lines, elevations, measurements, required for installation of his work.

## 1.10 OBJECTIONABLE NOISE AND VIBRATION

A. Electrical equipment shall operate without objectionable noise or vibration as determined by Engineer.

B. If objectionable noise or vibration is produced and transmitted to occupied portions of the building by the apparatus, due to poor workmanship, and/or omission of vibration isolators, shock absorbers, etc., the Contractor involved shall make necessary changes and additions, as approved and/or required, without additional cost to the Government.

## 1.11 EQUIPMENT DESIGN AND INSTALLATION

A. Uniformity: Unless otherwise specified, equipment or material of the same type or classification, and used for the same purpose shall be of the same manufacturer. All material shall be new and of the latest design of the manufacturer providing the equipment or material.

B. Design: Equipment and accessories not specifically described or identified by the manufacturer's catalog numbers shall be designed in conformity with AIEE or other applicable technical standards and shall be suitable for maximum working pressure and shall have a neat and finished appearance.

C. Installation: Erect equipment in a neat and workmanlike manner; align, level and adjust as required for satisfactory operation; install so that disconnecting can be made readily, and so that parts are easily accessible for inspection, operation, maintenance and repair. Minor deviations from indicated arrangements may be made only after obtaining approval from the Architect and Engineers.

**1.12 PROTECTION OF EQUIPMENT AND MATERIALS**

A. The following is in addition to Protection of Work and Property, in Conditions of Contract:
   1. Responsibility for care and protection of electrical work rests with the contractor until it has been tested and accepted.
   2. After delivery, before and after installation, protect all equipment and materials against theft, injury and damage from all causes.
   3. Protect equipment outlets and conduit openings with caps.
   4. Protect existing equipment which is to remain.

**1.13 HANDLING OF EQUIPMENT AND MATERIALS**

A. The Contractor shall receive, properly house, handle, hoist, and deliver to proper location, all equipment and other material required for his contract.

**1.14 WEATHERPROOF EQUIPMENT**

A. All electrical equipment exposed to the weather and/or high humidity areas shall be of the rain tight or weatherproof construction, whether specified or not, and of NEMA type as outlined by the National Electrical Code and/or as called for in the contract documents.

**1.15 ACCESSIBILITY OF ELECTRICAL EQUIPMENT**

A. It shall be the Contractor's responsibility to see that all electrical equipment such as junction boxes, pull boxes, panelboards, switches, controls and other apparatus as may require maintenance and operation from time to time are easily accessible.

**1.16 EXISTING CONDITIONS TO BE VERIFIED**

A. The data so indicated or inferred to as existing conditions are not intended as representations or warranties of accuracy of construction and existing conditions.

B. The data is made available for the convenience of the Contractor. The Contractor shall make all necessary additional field surveys and check all existing conditions prior to submitting his proposal at no cost to the Government and with the Government's approval.

C. The exact location of utilities and services is not guaranteed nor is there any guarantee that all existing utilities, services, shafts, structures, functional or abandoned are shown.

D. The Contractor shall verify in the field all dimensions, structures, services, whether or not shown in the contract documents. The Contractor shall field measure all conditions at the site and be responsible for their correctness. No extra charge or compensation will be allowed on account of any difference between actual dimensions and any measurements indicated on drawings. Any difference found shall be reported to the Architects/Engineers and Government in sufficient time for their consideration and direction before proceeding with the work involved.

**1.17 SUPERINTENDENCE**

A. The Contractor shall give his personal superintendence to the work or have a competent superintendent, satisfactory to the Architect/Engineer, on the work at all times, during construction, with authority to act for him. He shall provide an adequate organization for proper coordination and expediting of his work.

**1.18 SCAFFOLDING**

A. The Contractor shall furnish and install scaffolding ladders and runways as required in connection with his work.

**1.19 SAFETY**

A. The Contractor shall furnish and place necessary guards for the prevention of accidents. They shall provide and maintain any necessary construction required to secure safety to life or property.

**1.20 CUTTING, PATCHING, RESTORING**

A. All cutting and patching required in existing construction shall be done by the Contractor. Patching shall also include repairing of walls, floors, ceilings, etc. where existing equipment has been removed. The Contractor shall not do any cutting that may impair the strength of the building construction. No holes, except for small screws, may be drilled in beams or other structure members, without obtaining prior approval. The Contractor shall restore work of other contractors damaged by him. Any cutting and patching required in new construction due to errors, defective or ill-timed work or tardiness on the part of the contractor to designate sizes and locations to the General Contractor in sufficient time shall be paid for by the Contractor.

**1.21 TEMPORARY OPENINGS**

A. Temporary openings are not indicated in the contract documents but may be required for the purpose of bringing equipment into the building. A General Construction Contractor shall perform the work of providing, maintaining and of restoring the structure. The Electrical Contractor for whom the temporary opening is provided shall bear all costs thereof, including restoring the structure. Ample notice shall be given to the General Contractor as to the size and location of such temporary openings. Holes provided in General Construction work to permit installation of lines for temporary electrical service will, after removal of such lines, be patched by the Contractor.

**1.22 REMOVAL OF RUBBISH**

A. Periodically, and at the completion of the work contemplated under these specifications, the Contractor shall remove from the building and site all rubbish and accumulated materials of whatever nature and shall leave the work in a clean, orderly and acceptable condition. In addition, at the conclusion of the Project, and before the work is deemed ready for final inspection, the Contractor shall clean all items of paint splashes, grease stains, dust, finger marks, and all other unsightly marks.

**1.23 GUARANTEE**

A. In addition to the requirements listed hereinbefore and stated in the individual work sections, the Contractor must guarantee all materials and apparatus installed by him to be free from defects in construction and workmanship for a period of two (2) years after acceptance of the work.

**1.24 FIRE STOPPING SYSTEM**

A. The Contractor shall furnish and install all labor and materials necessary for the completion of fire stopping work as required for all conduit, cable, wiring, cable trays or similar through-penetrations of fire resistive walls, floors, floor-ceiling or roof-ceiling assemblies.

B. All materials and application procedures shall have been tested and classified by U.L. and approved by Factory Mutual for the assembly.

C. The Fire Stopping System shall have been tested in accordance with the procedures of ASTM E814-81 (U.L. 1479-1983) and shall be U.L. classified and Factory Mutual approved as a Through-Penetration Fire Stop System.

D. Contractor shall submit manufacturer's specifications and installation instructions for type of fire stopping required including data showing compliance with requirements.

## 1.25 ACCESS DOORS

A. Unless otherwise specified the Contractor shall provide access panels for concealed lighting fixtures, junction boxes, and other parts requiring accessibility for operation and maintenance.

## 1.26 PAINTING AND FINISHING

A. Except as specified herein the finish painting of all Electrical Work within the building and on the roof shall be by this Contractor.

B. Piping and Equipment Color Coding shall be by the respective Contractor as set forth under their respective sections of the specifications or as noted in the contract documents.

C. The respective Contractor shall clean all piping, insulation, conduit ducts and equipment of all plaster, cement, dirt and debris. Sizing of the insulation shall be performed by the insulation applicator. The Contractor shall provide protective finish on all ferrous materials installed by him. Hangers, rods, stands and similar devices that are not factory finished shall be covered with one coat of Rust-Oleum paint or approved equal of color selected to prevent oxidation.

D. All equipment provided with a factory finish shall not be painted. Primer coat on equipment in not considered a factory finish.

E. All painting shall consist of two coats of different tint.

F. All items of equipment rusted or marred even though factory finished shall be repainted.

G. Touch-up painting of work marred by respective trades shall be done by the respective Contractor to the satisfaction of the Architect/Engineer. Respective trades shall bear all costs involved.

## 1.27 EQUIPMENT IDENTIFICATION

A. All items of electrical equipment such as distribution equipment, switches, etc., shall be identified by approved nameplates provided by contractor furnishing equipment.

B. Nameplates shall be securely affixed to each individual piece of equipment.

## 1.28 SPECIAL ENGINEERING SERVICES

A. In the instance of complex or specialized electrical systems such as fire alarm, T.V., sound systems, etc. or similar miscellaneous systems; the installation, final connections and testing of such systems shall be made under the direct supervision of competent and authorized service engineers who shall be in the employ of the respective equipment manufacturer. Any and all expenses incurred by these equipment manufacturers' representatives shall be borne by the Contractor.

## 1.29 WIRE GAUGE

A. The sizes of conductors and thickness of metals shown in the contract documents or specified herein, shall be understood to be American Wire Gauge for copper wire and United States Gauge for metals.

## 1.30 TESTS - ELECTRICAL

A. At the time of the final inspection, all connections at panels and switches and all splices must be made; all fuses shall be in place and all circuits continuous from point of service connections to switches, receptacles, outlets, etc.

B. Upon completion of the work, all parts of the electrical installation shall be tested and proved free of unwanted grounds and other defects. Preliminary testing with magneto will be permitted but will not be accepted in obtaining final results. Final tests shall be accomplished by use of a megger.

C. All overload devices, including equipment furnished under other contracts, shall be set and adjusted to suit the load conditions.

D. Insulation resistance on switchgear and panelboards shall be at least one (1) megohm. The insulation resistance between conductors and ground, based on maximum load, shall be not less than the requirements of the National Electrical Code.

**1.31 RESPONSIBILITY FOR DAMAGE**

A. The Contractor at his own expense shall make good to the Architect/Engineer's satisfaction any damage to his or any work incurred by the action of the elements or any other cause due to neglect on the part of the Contractor or his workmen.

**1.32 EQUIPMENT FOUNDATIONS**

A. The Contractor shall provide all concrete foundations required for equipment furnished under these specifications unless otherwise noted in the contract documents or in the specifications.

B. All foundations shall be built to templates and reinforced as required by the load to be imposed upon them.

C. The Contractor shall furnish shop drawings showing size and location, in detail, for all foundations for equipment, for approval before any construction is begun, and shall assume all responsibility for the size and location of all foundations.

**1.33 MISCELLANEOUS IRON WORK**

A. The Contractor shall furnish and install necessary structural supporting steel for supports of all suspended equipment, lighting fixtures and all other equipment furnished by him requiring support steel and for equipment as noted in the contract documents.

**1.34 ROOF AND WALL OPENINGS**

A. Roof and wall openings and flashing for electrical conduits and other items which penetrate the walls and roof shall be by the Contractor. Unless otherwise noted counter-flashing required for all items shall be by the Contractor.

**1.35 CUTTING AND PATCHING**

A. The Contractor shall do, or cause to be done under his supervision, all cutting, patching, repairing, altering and refinishing of construction and finishes as required by the operations of all trades and subcontractors so as to leave all constructions and finishes complete and in a condition that is satisfactory to the Architect/Engineer and Government.

B. Cutting and patching shall be avoided by every means possible and to this end, the Contractor shall closely coordinate and supervise the work of all trades and subcontractors.

C. Cutting and patching shall be neatly and carefully done in a thorough and workmanlike manner. Patches and repairs shall be as inconspicuous as possible, and shall be subject to approval by the Architect/Engineer and Government. Any contractor cutting and/or altering existing construction shall be responsible to repair, patch and refinish such work.

D. Any extra cost caused by defective, ill-timed or premature work, or the refusal of any trade or contractor to cooperate, to provide or complete any portion of his respective work at the proper time and in the proper manner, shall be borne by the party responsible for causing the extra cost and not by the Government.

E. The Contractor shall inspect interior concrete floor slabs in the project area, and patch or repair any irregularities as required to create smooth, level floor.

F. All upper level work requiring cutting and patching or penetration of floor slab shall include all patching and repair of floor slab and all patching, repair and replacement of any disturbed lower level ceiling work.

**1.36 EXISTING CONDITIONS (REMOVAL OF ABANDONED MATERIALS AND/OR EQUIPMENT)**

A. Unless otherwise noted in the contract documents, the Contractor shall remove from their present locations in the renovated areas, and from the premises, all existing equipment not applicable to the new installation or as indicated in the contract documents and required to accomplish the new installation.

B. The Contractor shall remove all existing conduit, electrical equipment and all other items not applicable to the revised installation and/or as indicated in the contract documents.

C. Unless otherwise noted in the contract documents, or in the specifications, all existing equipment to be removed is to become the property of the Contractor and shall be removed from the premises and disposed of by the Contractor. The Contractor shall verify if Government wishes to retain any equipment before removing from site.

D. All abandoned conduits, etc., which run concealed shall be cut off below floor or above ceiling, as required.

E. The Contractor shall disconnect any service to this equipment, prior to removal.

F. Where existing circuits in other areas of the building are partially affected by the renovations; and continuity of service must be maintained in the remainder of the circuit, conductors shall be properly spliced and taped and said outlets where necessary shall be extended to the new finished surfaces in order to maintain accessibility to the outlet.

**1.37 INTERRUPTION OF ELECTRICAL SERVICE**

A. The Contractor's attention is called to the fact that the existing facilities must remain in operation during the construction period. In view of this, the Electrical Contractor shall maintain services for these facilities until such time that the new services are installed, energized and ready for connecting.

B. All work shall be done in such time and manner as will least interfere with the maintenance and operation of all related or affected existing electrical systems. Provisions must be made to permit the use of all systems at all times by the Government. Any interruptions to systems required to perform the work shall be pre-arranged, in advance, with the Government. The Contractor shall provide temporary services as required to accomplish this.

**1.38 TEMPORARY POWER AND LIGHT**

A. The Contractor shall provide all necessary wiring facilities for temporary electricity required for construction purposes.

**1.39 TEMPORARY MEDICAL SERVICE AND FIRST AID**

A. The Contractor shall provide and maintain medical services and first aid all in accordance with the regulations of OSHA, Department of Labor, Chapter 17, Part 1926, Subpart D, Section 1926.50.

B. OTHER SAFETY MEASURES

C. The Contractor shall comply with all other applicable OSHA requirements for the safety in building construction which are not specifically mentioned in this Section of the Specifications.

**PART 2 PRODUCTS - NOT APPLICABLE.**

**PART 3 EXECUTION - NOT APPLICABLE.**

**3.01 END OF SECTION 260000**

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# SECTION 260526
# GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.01 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

F. UL 891 - Switchboards; Current Edition, Including All Revisions.

### 1.02 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 1.03 RELATED DOCUMENTS

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

### 1.04 SUMMARY

A. Section includes grounding and bonding systems and equipment.

### 1.05 SUBMITTALS

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

B. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Grounding arrangements and connections for separately derived systems.

C. Field quality-control reports.

D. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      a. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systemsbased on NETA MTS.
         1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
         2) Include recommended testing intervals.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Manufacturers:Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Burndy; Part of Hubbell Electrical Systems.
   2. Dossert; AFL Telecommunications LLC.
   3. ERICO International Corporation.
   4. Fushi Copperweld Inc.

5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning & Grounding.
7. ILSCO.
8. O-Z/Gedney; a brand of Emerson Industrial Automation.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.
11. Thomas & Betts Corporation, A Member of the ABB Group.

**2.02 SYSTEM DESCRIPTION**

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

**2.03 CONDUCTORS**

A. Insulated Conductors: Copper tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

C. Solid Conductors: ASTM B3.

D. Stranded Conductors: ASTM B8.

E. Tinned Conductors: ASTM B33.

F. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6.35 mm) in diameter.

G. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) Insert dimensions in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (29 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

**2.04 CONNECTORS**

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression -type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Conduit Hubs: Mechanical type, terminal with threaded hub.

G. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

I. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

J. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

K. Water Pipe Clamps:

L. Mechanical type, two pieces with zinc-plated, stainless-steel bolts.
   1. Material: Tin-plated aluminum.
   2. Listed for direct burial.
   3. U-bolt type with malleable-iron clamp and copper ground connector.

## 2.05 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch (19.05 mm) by 10 feet (304.8 cm).

B. Ground Plates: 1/4 inch (6.35 mm) thick, hot-dip galvanized.

# PART 3 EXECUTION

## 3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

D. Install bus horizontally, on insulated spacers 2 inches (50.8 mm) minimum from wall, 6 inches (152.4 mm) above finished floor unless otherwise indicated.

E. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

F. Conductor Terminations and Connections:

G. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

H. Connections to Structural Steel: Welded connectors.

## 3.02 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

## 3.03 INSTALLATION

A. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

B. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

C. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

D. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

**3.04 FIELD QUALITY CONTROL**

A. Perform tests and inspections.

B. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
   4. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

**END OF SECTION 260526**

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**END OF SECTION**

# SECTION 260529
# HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.01 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 1.02 RELATED DOCUMENTS

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

### 1.03 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

### 1.04 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RMC: Rigid metal conduit.

### 1.05 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Errata (2026).

C. MFMA-4 - Metal Framing Standards Publication; 2004.

D. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals; 2024, with Errata (2025).

### 1.06 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

### 1.07 SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
   1. Trapeze hangers. Include Product Data for components.
   2. Steel slotted channel systems. Include Product Data for components.
   3. Equipment supports.

C. Welding certificates.

**1.08 QUALITY CONTROL**

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

**1.09 COORDINATION**

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section"Roof Accessories."

**PART 2 PRODUCTS**

**2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Hilti Inc.
         2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
         3) MKT Fastening, LLC.
         4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
   2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Cooper B-Line, Inc.; a division of Cooper Industries.

2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

## PART 3 EXECUTION

### 3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6.35 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Exterior hangers and supports shall be galvanized stainless steel (grade 35P or above).

### 3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To New Concrete: Bolt to concrete inserts.
   2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   3. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
   4. To Light Steel: Sheet metal screws.
   5. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

### 3.03 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (101.6 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.
   1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts to elevations required for proper attachment to supported equipment.
   3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

**3.04 PAINTING**

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils 0 inch (0.05 mm).

B. Touchup: Comply with requirements in Section "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION 260529**

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# SECTION 260533
# RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.01 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 1.02 RELATED DOCUMENTS

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

### 1.03 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Metal wireways and auxiliary gutters.
   3. Surface raceways.
   4. Boxes, enclosures, and cabinets.

B. Related Requirements:
   1. Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

### 1.04 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

### 1.05 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2025.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2025.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

F. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

H. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

K. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.

L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

M. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

N. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

R. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings; Current Edition, Including All Revisions.

S. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

T. UL 1773 - Termination Boxes; Current Edition, Including All Revisions.

**1.06 SUBMITTALS**

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

**PART 2 PRODUCTS**

**2.01 METAL CONDUITS, TUBING, AND FITTINGS**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Allied Tube & Conduit.
   3. Anamet Electrical, Inc.
   4. Electri-Flex Company.
   5. O-Z/Gedney.
   6. Robroy Industries.
   7. Southwire Company.
   8. Thomas & Betts Corporation.
   9. Western Tube and Conduit Corporation.
   10. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT:
      a. Material: Steel.
      b. Type: compression.
   3. Expansion Fittings: Steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
   4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1.02 mm), with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

**2.02 METAL WIREWAYS AND AUXILIARY GUTTERS**

A. Description: Sheet metal, complying with UL 870 and NEMA 250, unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Wireway Covers: Screw-cover type Flanged-and-gasketed type unless otherwise indicated.

D. Finish: Manufacturer's standard enamel finish.

**2.03 SURFACE RACEWAYS**

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL
5. Manufacturer's standard enamel finish in color selected by Architect.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Mono-Systems, Inc.
      b. Panduit Corp.
      c. Wiremold / Legrand.

**2.04 BOXES, ENCLOSURES, AND CABINETS**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Adalet.
   2. Cooper Technologies Company; Cooper Crouse-Hinds.
   3. EGS/Appleton Electric.
   4. Erickson Electrical Equipment Company.
   5. FSR Inc.
   6. Hoffman.
   7. Hubbell Incorporated.
   8. Kraloy.
   9. Milbank Manufacturing Co.
   10. Mono-Systems, Inc.
   11. O-Z/Gedney.
   12. RACO; Hubbell.
   13. Robroy Industries.
   14. Spring City Electrical Manufacturing Company.
   15. Stahlin Non-Metallic Enclosures.
   16. Thomas & Betts Corporation.
   17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:
   1. Material: Cast metal.
   2. Type: Fully adjustable Semi-adjustable.
   3. Shape: Rectangular.
   4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

I. Gangable boxes are allowed.

J. Cabinets:
   1. NEMA 250, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
   6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## PART 3 EXECUTION

### 3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: IMC.
   3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Branch circuit exposed, Not Subject to Physical Damage: EMT.
   2. Branch circuit and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:
      a. Mechanical rooms.
   3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   5. Damp or Wet Locations: GRCor IMC.
   6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250.
   7. Feeders: IMC.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
   3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 degrees Fahrenheit (48.89 degrees Celsius).

### 3.02 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum

conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (152.4 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (304.8 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (304.8 mm)of enclosures to which attached.

I. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m)intervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 2 inches (50.8 mm) of concrete cover in all directions.
   4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

J. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (304.8 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service raceway enters a building or structure.
   3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:
   1. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 degrees Fahrenheit (37.78 degrees Celsius) and that has straight-run length that exceeds 100 feet (3048 cm).
   2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
      a. Outdoor Locations Not Exposed to Direct Sunlight: 125 degrees Fahrenheit (51.67 degrees Celsius) temperature change.
      b. Outdoor Locations Exposed to Direct Sunlight: 155 degrees Fahrenheit (68.33 degrees Celsius) temperature change.
      c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 degrees Fahrenheit (51.67 degrees Celsius) temperature change.
      d. Attics: 135 degrees Fahrenheit (57.22 degrees Celsius) temperature change.
      e. .

W. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch (0.01 mm) per foot of length of straight run per deg F (0 inch (0.06 mm) per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch (0 mm) per foot of length of straight run per deg F (0 inch (0.01 mm) per meter of length of straight run per deg C) of temperature change for metal conduits.

X. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

Y. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Z. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1828.8 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC in damp or wet locations subject to severe physical damage.
   2. Use LFMC in damp or wet locations not subject to severe physical damage.

AA. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

BB. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

CC. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

DD. Locate boxes so that cover or plate will not span different building finishes.

EE. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

FF. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

GG. Set metal floor boxes level and flush with finished floor surface.

**3.03 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS**

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

**3.04 FIRESTOPPING**

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section "Penetration Firestopping."

**3.05 PROTECTION**

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION**

# SECTION 260544
# SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

## PART 1 GENERAL

### 1.01 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

B. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

### 1.02 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 1.03 RELATED DOCUMENTS

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

### 1.04 SUMMARY

A. Section Includes:
   1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
   2. Sleeve-seal systems.
   3. Sleeve-seal fittings.
   4. Grout.
   5. Silicone sealants.

B. Related Requirements:
   1. Section "enetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

### 1.05 SUBMITTALS

A. Product Data: For each type of product.

## PART 2 PRODUCTS

### 2.01 SLEEVES

A. Wall Sleeves:
   1. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

### 2.02 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, Inc.
      b. CALPICO, Inc.
      c. Metraflex Company (The).
      d. Pipeline Seal and Insulator, Inc.
      e. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

**2.03 SLEEVE-SEAL FITTINGS**

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Presealed Systems.

**2.04 GROUT**

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

**2.05 SILICONE SEALANTS**

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

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

**PART 3 EXECUTION**

**3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS**

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section"Joint Sealants."
      b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
   5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50.8 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

**3.02 SLEEVE-SEAL-SYSTEM INSTALLATION**

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

**3.03 SLEEVE-SEAL-FITTING INSTALLATION**

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

**END OF SECTION**

# SECTION 260553
# IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.01 REFERENCE STANDARDS

A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.

B. 29 CFR 1910.145 - Accident Prevention Signs and Tags; Current Edition.

C. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

D. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

E. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

H. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

### 1.02 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 1.03 RELATED DOCUMENTS

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

### 1.04 SUMMARY

A. Section Includes:
   1. Identification for raceways.
   2. Identification of power and control cables.
   3. Identification for conductors.
   4. Warning labels and signs.
   5. Instruction signs.
   6. Equipment identification labels.
   7. Miscellaneous identification products.

### 1.05 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

### 1.06 QUALITY CONTROL

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

### 1.07 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's

wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 PRODUCTS

### 2.01 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage.

C. Colors for Raceways Carrying Circuits at More Than 600 V:
   1. Black letters on an orange field.
   2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

### 2.02 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Colors for Cables Carrying Circuits at 600 V and Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage.

C. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50.8 mm) wide; compounded for outdoor use.

### 2.03 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

### 2.04 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils 0 inch (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

### 2.05 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

### 2.06 UNDERGROUND-LINE WARNING TAPE

A. Tape:
   1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
   2. Printing on tape shall be permanent and shall not be damaged by burial operations.
   3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
   1. Comply with ANSI Z535.1 through ANSI Z535.5.
   2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE, Insert inscription.
   3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

**2.07 WARNING LABELS AND SIGNS**

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

**2.08 INSTRUCTION SIGNS**

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.59 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.18 mm) thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (9.52 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

**2.09 EQUIPMENT IDENTIFICATION LABELS**

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (9.52 mm).

**2.10 CABLE TIES**

A. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
   1. Minimum Width: 3/16 inch (4.76 mm).
   2. Tensile Strength at 73 degrees Fahrenheit (22.78 degrees Celsius), According to ASTM D638: 7000 psi (48263.32 kPa).
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 degrees Fahrenheit (140 degrees Celsius).
   5. Color: Black.

**2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS**

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (406.4 mm) overall.

I. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

**3.02 IDENTIFICATION SCHEDULE**

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (304.8 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:
   1. Floor surface directly above conduits running beneath and within 12 inches (304.8 mm) of a floor that is in contact with earth or is framed above unexcavated space.
   2. Wall surfaces directly external to raceways concealed within wall.
   3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 30-foot (10-m) maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 30-foot (10-m) maximum intervals.

D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
   1. Emergency Power.
   2. UPS.

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service conductors.
      a. Color shall be factory applied.
      b. Colors for 208/110-V Circuits:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral: Grey.
      c. Colors for 480V Circuits:

1) Phase A: Bronw
2) Phase B: Orange
3) Phase C: Yellow
4) Neutral: White

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (152.4 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

F. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags.

G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
a. Power transfer switches.
b. Controls with external control power connections.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50.8 mm) high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
2. Equipment to Be Labeled:
a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.

d. Switchgear.
e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
f. Emergency system boxes and enclosures.
g. Enclosed switches.
h. Enclosed circuit breakers.
i. Enclosed controllers.
j. Variable-speed controllers.
k. Push-button stations.
l. Power transfer equipment.
m. Contactors.
n. Power-generating units.
o. Monitoring and control equipment.
p. UPS equipment.

**END OF SECTION 260553**

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**END OF SECTION**

# SECTION 262416
# PANELBOARDS

## PART 1 GENERAL

### 1.01 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 1.02 RELATED DOCUMENTS

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

B. Buy American Act shall apply to all products and associated components governed by this Section.

### 1.03 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

### 1.04 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

### 1.05 REFERENCE STANDARDS

A. ANSI C12.20 - American National Standard for Electricity Meters - 0.1, 0.2, and 0.5 Accuracy Classes; 2022.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2025.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

F. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

### 1.06 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Include evidence of NRTL listing for series rating of installed devices.
   6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   7. Include wiring diagrams for power, signal, and control wiring.
   8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

C. Qualification Data: For qualified testing agency.

D. Field Quality-Control Reports:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

G. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Keys: Two spares for each type of panelboard cabinet lock.
   2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.
   3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
   4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

## 1.07 QUALITY CONTROL

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

## 1.08 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407.

## 1.09 PROJECT CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 degrees Fahrenheit (-5 degrees Celsius) to plus 104 degrees Fahrenheit (40 degrees Celsius).
b. Altitude: Not exceeding 6600 feet (201168 cm).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (201168 cm).

**1.10 COORDINATION**

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

**1.11 WARRANTY**

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices and circuit breakers that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS FOR PANELBOARDS**

A. Enclosures: Flush- and surface-mounted cabinets.
1. Rated for environmental conditions at installed location.
a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5.
2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Finishes:
a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel.
5. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: Top and bottom.

C. Phase, Neutral, and Ground Buses:
1. Material: Copper.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

D. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Tin-plated aluminum.
2. Main and Neutral Lugs: Compression type.

3. Ground Lugs and Bus-Configured Terminators: Compression type.
4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

## 2.02 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
1. For doors more than 36 inches (914.4 mm) high, provide two latches, keyed alike.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

G. Surge Protection: Provide UL 1449 Class "B" Listed Integral TVSS protection, 160 Ka/Phase.

## 2.03 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit Breaker.

D. Branch Overcurrent Protective Devices: Bolt on circuit breakers, replaceable without disturbing adjacent units.

E. Surge Protection: PRovide UL 1449 Class "B" Listed Integral TVSS Protection, 80 Ka/Phase.

F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

## 2.04 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with nterrupting capacity to meet available fault currents. (Series rated breakers will not be approved).

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
   c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.HACRHACR rated breakers for all HVAC equipment as shown on the contract documents.

**2.05 KWH/KW DEMAND SUB-METER**

A. Three phase kw/kwh demand sub-meter voltage rating to match equipment, JK enclosure, with CT's and PT's, ANSI C12.20 Accuracy. Emon Dmon Class 2000 or approved equal.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Receive, inspect, handle, and store panelboards according to NECA 407.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 INSTALLATION**

A. Install panelboards and accessories according to NECA 407.

B. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base.
   1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
   2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   4. Install anchor bolts to elevations required for proper attachment to panelboards.
   5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

D. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.

G. Install filler plates in unused spaces.

H. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

J. Comply with NECA 1.

## 3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section "Identification for Electrical Systems."

## 3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Perform the following infrared scan tests and inspections and prepare reports:
      a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
      b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
      c. Instruments and Equipment:
         1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.Utilize FLIR P65 or engineer approved equal.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports (in microsoft word or excell), including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

## 3.05 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
   1. Measure as directed during period of normal system loading.
   2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

**3.06 PROTECTION**

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

**END OF SECTION 262416**

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# SECTION 262726
# WIRING DEVICES

## PART 1 GENERAL

### 1.01 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 1.02 RELATED DOCUMENTS

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

### 1.03 SUMMARY

A. Section Includes:
   1. Straight-blade convenience, isolated-ground, and tamper-resistant receptacles.
   2. USB charger devices.
   3. GFCI receptacles.
   4. SPD receptacles.
   5. Twist-locking receptacles.
   6. Pendant cord-connector devices.
   7. Cord and plug sets.
   8. Toggle switches.
   9. Wall plates.
   10. Floor service outlets.
   11. Poke-through assemblies.
   12. Prefabricated multioutlet assemblies.

### 1.04 DEFINITIONS

A. Abbreviations of Manufacturers' Names:
   1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
   2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
   3. Leviton: Leviton Mfg. Company, Inc.
   4. Pass & Seymour: Pass& Seymour/Legrand.

B. BAS: Building automation system.

C. EMI: Electromagnetic interference.

D. GFCI: Ground-fault circuit interrupter.

E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

F. RFI: Radio-frequency interference.

G. SPD: Surge protective device.

H. UTP: Unshielded twisted pair.

### 1.05 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

H. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

**1.06 SUBMITTALS**

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control reports.

E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

**PART 2 PRODUCTS**

**2.01 GENERAL WIRING-DEVICE REQUIREMENTS**

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices for Owner-Furnished Equipment:
   1. Receptacles: Match plug configurations.
   2. Cord and Plug Sets: Match equipment requirements.

D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

**2.02 STRAIGHT-BLADE RECEPTACLES**

A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
   1. Products:Subject to compliance with requirements, provide one of the following , available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; Commercial Grade Receptacles 20A-125V NEMA 5-20R - BR20Construction Grade Receptacles 20A-125V NEMA 5-20R - 5362, 5362__MCorrosion Resistant Premium Industrial Grade 20A-125V NEMA 5-20R - 5362CRIndustrial Grade Receptacles 20A-125V NEMA 5-20R - 5352, 5352__M, 5342, 5351Premium Industrial Grade Receptacles 20A-125V NEMA 5-20R - AH5362, AH5362_M, 5361, 5361_MWeather Resistant Commercial Grade Receptacles 20A-125V NEMA 5-20R - WRBR20.
      b. Hubbell Incorporated; Wiring Device-Kellems; HBL 5361HBL 5362HBL5351 (single), HBL5352 (duplex)HBL5352 (duplex).
      c. Leviton Manufacturing Co., Inc.; 5891 (single), 5352 (duplex).
      d. Pass & Seymour/Legrand (Pass & Seymour); 5361 (single), 5362 (duplex).

B. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
   1. Products:Subject to compliance with requirements, provide one of the following , available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; Tamper Resistant Commercial Grade Receptacles 20A-125V NEMA 5-20R - TRBR20, TR1877, TR6352, TR6350Tamper Resistant Construction Grade Receptacles 20A-125V NEMA 5-20R - TR5362, TR5362__MTR8300.
      b. Hubbell Incorporated; Wiring Device-Kellems; AFR20TRWBR20TRHBL 8300 SGA.
      c. Leviton Manufacturing Co., Inc.; 800-SGG.
      d. Pass & Seymour/Legrand (Pass & Seymour); TR63H.

2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

## 2.03 GFCI RECEPTACLES

A. General Description:
1. 125 V, 20 A, straight blade, feed -through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles:
1. Products:Subject to compliance with requirements, provide one of the following , available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; Commercial Specification Grade Combination GFCI with Nightlight 15A & 20AVGF20.
   b. Hubbell Incorporated; Wiring Device-Kellems; Insert product designation.
   c. Leviton Manufacturing Co., Inc.; 7590.
   d. Pass & Seymour/Legrand (Pass & Seymour); 2095.

C. Tamper-Resistant, Duplex GFCI Convenience Receptacles:
1. Products:Subject to compliance with requirements, provide one of the following, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Hubbell Incorporated; Wiring Device-Kellems; GFTR20.
   b. Pass & Seymour/Legrand (Pass & Seymour); 2095TR.
   c. Or approved equal.

## 2.04 TWIST-LOCKING RECEPTACLES

A. Twist-Lock, Single Receptacles: Ratings as indicated; comply with NEMA WD1, NEMA WD 6 Configuration , and UL 498.
1. Products:Subject to compliance with requirements, provide one of the following , available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; CWL520R.
   b. Hubbell Incorporated; Wiring Device-Kellems; HBL2310.
   c. Leviton Manufacturing Co., Inc.; 2310.
   d. Pass & Seymour/Legrand (Pass & Seymour); L520-R.

## 2.05 PENDANT CORD-CONNECTOR DEVICES

A. Description:
1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

## 2.06 CORD AND PLUG SETS

A. Description:
1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.

3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

**2.07 TOGGLE SWITCHES**

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
   1. Single Pole:
      a. Products:Subject to compliance with requirements, provide one of the following , available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; AH1221 AC Quiet Toggle SwitchesBack & Side Wire Switches CSB115Side Wire Switches CS115.
         2) Hubbell Incorporated; Wiring Device-Kellems; HBL1221.
         3) Leviton Manufacturing Co., Inc.; 1221-2.
         4) Pass & Seymour/Legrand (Pass & Seymour); CSB20AC1.
   2. Two Pole:
      a. Products:Subject to compliance with requirements, provide one of the following , available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; AH1222Back & Side Wire Switches CSB115Side Wire Switches CS115.
         2) Hubbell Incorporated; Wiring Device-Kellems; HBL1222.
         3) Leviton Manufacturing Co., Inc.; 1222-2.
         4) Pass & Seymour/Legrand (Pass & Seymour); CSB20AC2.
   3. Three Way:
      a. Products:Subject to compliance with requirements, provide one of the following , available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; AH1223Back & Side Wire Switches CSB115Side Wire Switches CS115.
         2) Hubbell Incorporated; Wiring Device-Kellems; HBL1223.
         3) Leviton Manufacturing Co., Inc.; 1223-2.
         4) Pass & Seymour/Legrand (Pass & Seymour); CSB20AC3.
   4. Four Way:
      a. Products:Subject to compliance with requirements, provide one of the following , available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; AH1224Back & Side Wire Switches CSB115Side Wire Switches CS115.
         2) Hubbell Incorporated; Wiring Device-Kellems; HBL1224.
         3) Leviton Manufacturing Co., Inc.; 1224-2.
         4) Pass & Seymour/Legrand (Pass & Seymour); CSB20AC4.

C. Pilot-Light Switches: 120/277 V, 20 A.
   1. Products:Subject to compliance with requirements, provide one of the following , available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; AH1221PL for 120 and 277 V.
      b. Hubbell Incorporated; Wiring Device-Kellems; HBL 1221 PlHBL1201PL for 120 and 277 V.
      c. Leviton Manufacturing Co., Inc.; 1221-LH1.
      d. Pass & Seymour/Legrand (Pass & Seymour); PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with LED-lighted handle, illuminated when switch is off.

D. Key-Operated Switches: 120/277 V, 20 A.
1. Products:Subject to compliance with requirements, provide one of the following, :
a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; AH1221L.
b. Hubbell Incorporated; Wiring Device-Kellems; HBL 1221 L.
c. Leviton Manufacturing Co., Inc.; 1221-2L.
d. Pass & Seymour/Legrand (Pass & Seymour); PS20AC1-L.

E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Products:Subject to compliance with requirements, , available products that may be incorporated into the Work include, but are not limited to, the following:
a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; 1995.
b. Hubbell Incorporated; Wiring Device-Kellems; HBL1557.
c. Leviton Manufacturing Co., Inc.; 1257.
d. Pass & Seymour/Legrand (Pass & Seymour); 1251.

**2.08 WALL PLATES**

A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

**2.09 FINISHES**

A. Device Color:
1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
2. SPD Devices: Blue.
3. Isolated-Ground Receptacles: Orange.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
   a. Cut back and pigtail, or replace all damaged conductors.
   b. Straighten conductors that remain and remove corrosion and foreign matter.
   c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152.4 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

## 3.02 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

## 3.03 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black -filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

## 3.04 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. Wiring device will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

**END OF SECTION 262726**

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**END OF SECTION**

# SECTION 262813
# FUSES

## PART 1 GENERAL

### 1.01 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

### 1.02 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 1.03 RELATED DOCUMENTS

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

### 1.04 SUMMARY

A. Section Includes:
   1. Cartridge fuses rated 600 V ac and less for use in the following:
      a. Enclosed switches.

### 1.05 SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
   1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.

B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper Bussmann.
   2. Edison; a brand of Cooper Bussmann.
   3. Littelfuse, Inc.
   4. Mersen USA.

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

### 2.02 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 FUSE APPLICATIONS**

A. Cartridge Fuses:
   1. Feeders: Class RK1, fast acting.

**3.03 INSTALLATION**

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

**3.04 IDENTIFICATION**

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

**END OF SECTION 262813**

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**END OF SECTION**

# SECTION 262816
# ENCLOSED SWITCHES AND CIRCUIT BREAKERS

## PART 1 GENERAL

### 1.01 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 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:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Shunt trip switches.
   4. Enclosures.

### 1.04 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

### 1.05 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

D. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

### 1.06 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
   6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Manufacturer's field service report.

F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section"Operation and Maintenance Data," include the following:
1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

G. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

**1.07 QUALITY CONTROL**

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

**1.08 PROJECT CONDITIONS**

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
1. Ambient Temperature: Not less than minus 22 degrees Fahrenheit (-5.56 degrees Celsius) and not exceeding 104 degrees Fahrenheit (40 degrees Celsius).
2. Altitude: Not exceeding 6600 feet (201168 cm).

**1.09 COORDINATION**

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

**1.10 WARRANTY**

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace enclosed switches and circuit breakers that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five years from date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 FUSIBLE SWITCHES**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors.
   3. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
   4. Lugs: Mechanical type, suitable for number, size, and conductor material.
   5. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

**2.02 NONFUSIBLE SWITCHES**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors.
   3. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
   4. Lugs: Mechanical type, suitable for number, size, and conductor material.
   5. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

**2.03 ENCLOSURES**

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.
   3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
   4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   5. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 INSTALLATION**

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

## 3.03 IDENTIFICATION

A. Comply with requirements in Section "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

## 3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Perform the following infrared scan tests and inspections and prepare reports:
      a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 calendar days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
      b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
      c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device. Utilize FLIR P65 or engineer approved equal.
   4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

## 3.05 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section "Overcurrent Protective Device Coordination Study."

**END OF SECTION**

# SECTION 283111
# DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

## PART 1 GENERAL

### 1.01 STIPULATIONS

A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

### 1.02 RELATED DOCUMENTS

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

### 1.03 SUMMARY

A. Section Includes:
   1. Fire-alarm control unit modifications.
   2. System smoke detectors.
   3. Heat detectors.
   4. Addressable interface devices.

### 1.04 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. NICET: National Institute for Certification in Engineering Technologies.

### 1.05 REFERENCE STANDARDS

A. IEEE 1100 - IEEE Recommended Practice for Powering and Grounding Electronic Equipment; 2005.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

D. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.

F. UL 521 - Standard for Heat Detectors for Fire Protective Signaling Systems; Current Edition, Including All Revisions.

### 1.06 SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.
   1. Include construction details, material descriptions, dimensions, profiles, and finishes.
   2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.
   1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
   2. Include plans, elevations, sections, details, and attachments to other work.
   3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
   4. Detail assembly and support requirements.
   5. Include battery-size calculations.

6. Include input/output matrix.
7. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
8. Include performance parameters and installation details for each detector.
9. These required shop drawings shall be provided as updates to the existing shop drawings. The device designations shall follow the nomenclature used throughout the building. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:
1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications and submitted before any fire alarm work is completed:
   a. Trained and certified by manufacturer in fire-alarm system design.
   b. NICET-certified, fire-alarm technician; Level IV minimum.

D. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
   a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
   c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
   d. Riser diagram.
   e. Device addresses.
   f. Record copy of site-specific software.
   g. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
      1) Equipment tested.
      2) Frequency of testing of installed components.
      3) Frequency of inspection of installed components.
      4) Requirements and recommendations related to results of maintenance.
      5) Manufacturer's user training manuals.
   h. Manufacturer's required maintenance related to system warranty requirements.

E. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
2. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
3. Keys and Tools: One extra set for access to locked or tamperproofed components.

## 1.07 QUALITY CONTROL

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project. Programming shall be executed by an EST certified fire alarm technician. They shall be certified by the manufacturer to work on EST fire alarm systems. All work shall be performed in concert with the manufacturer so as not to void the current warranty on the fire alarm system. Submit documentation inidicating the warranty is still in effect for the

existing fire alarm system. Any new work in connection with this project shall be warranted for a minimum of two years.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

**1.08 PROJECT CONDITIONS**

A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.

B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
   1. Notify Owner no fewer than 14 calendar days in advance of proposed interruption of fire-alarm service.
   2. Do not proceed with interruption of fire-alarm service without Owner's written permission.

C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

**1.09 SEQUENCING AND SCHEDULING**

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted.

B. The GSA fire protection engineer or his representative shall be contacted 5 weeks before anticipated completion of the work to arrange for a date for witness testing and acceptance.
   1. All testing shall be outside normal government occupied working hours on a weekend at a time acceptable to the designated witness.

**1.10 WARRANTY**

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
   1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
   2. Warranty Period: 2 years from date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 SYSTEM DESCRIPTION**

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

**2.02 MANUFACTURER**

A. The existing fire alarm system is a SImplex 4100U Type. Provide all equipment compatible with existing system.

B. The above item has been approved by the Department as a Proprietary Item. No other item will be accepted. Article 9, Paragraph 9.6, Substitution of Materials, of the General Conditions to the Construction Contract does not apply to the above item.

## 2.03 SYSTEMS OPERATIONAL DESCRIPTION

A. The current schemes for fire alarm, supervisory and trouble signals shall be maintained the same as they currently are on the system. New devices shall follow suit.

B. Fire-alarm signal initiation shall be by one or more of the following devices:
   1. Heat detectors.
   2. Smoke detectors.

C. Fire-alarm signal initiation shall be maintained sourced follows:
   1. Continuously operate alarm notification appliances.
   2. Identify alarm and specific initiating device at fire-alarm control unit.
   3. Transmit an alarm signal to the remote alarm receiving station.
   4. Unlock electric door locks in designated egress paths.
   5. Release fire and smoke doors held open by magnetic door holders.
   6. Activate voice/alarm communication system.
   7. Close smoke dampers in air ducts of designated air-conditioning duct systems.
   8. Recall elevators to primary or alternate recall floors.
   9. Activate elevator power shunt trip.
   10. Record events in the system memory.
   11. Indicate device in alarm on the fire alarm annunciators.

D. Supervisory signal initiation shall be maintained sourced as follows:
   1. Elevator shunt-trip supervision.
   2. loss of power.
   3. User disabling of zones or individual devices.

E. System trouble signal initiation shall be maintained sourced follows:
   1. Open circuits, shorts, and grounds in designated circuits.
   2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
   3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
   4. Loss of primary power at fire-alarm control unit.
   5. Ground or a single break in internal circuits of fire-alarm control unit.
   6. Abnormal ac voltage at fire-alarm control unit.
   7. Break in standby battery circuitry.
   8. Failure of battery charging.
   9. Abnormal position of any switch at fire-alarm control unit or annunciator.

F. System Supervisory Signal Actions:
   1. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
   2. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
   3. Transmit system status to building management system.

## 2.04 FIRE-ALARM CONTROL UNIT PERFORMANCE

A. The current performance for wiring and function shall be maintained.

B. Programming shall be executed by an EST certified fire alarm technician. They shall be certified by the manufacturer to work on EST fire alarm systems.

C. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
   1. Pathway Class Designations: NFPA 72, Class A, B ("T" tapping not allowed).
   2. Pathway Survivability: Level 1.
   3. Install no more than 256 addressable devices on each signaling-line circuit.

D. Elevator Recall:
   1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:

a. Elevator lobby detectors except the lobby detector on the designated floor.
b. Smoke detector in elevator machine room.
c. Smoke detectors in elevator hoistway.

2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.

E. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

F. Instructions: Modify and add to the computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

G. Update programming.

**2.05 SYSTEM SMOKE DETECTORS**

A. Manufacturers: Subject to compliance with requirements, provide smoke detectors that are compatible with the existing EST fire alarm system.:

B. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
6. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
   a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 degrees Fahrenheit (-6.67 degrees Celsius) per minute.
   b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 degrees Fahrenheit (68.33 degrees Celsius).
   c. Multiple levels of detection sensitivity for each sensor.
   d. Sensitivity levels based on time of day.

C. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

## 2.06 HEAT DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide heat detectors that are compatible with the existing fire alarm system. :

B. General Requirements for Heat Detectors: Comply with UL 521.
   1. Temperature sensors shall test for and communicate the sensitivity range of the device.

C. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 degrees Fahrenheit (57.22 degrees Celsius) or a rate of rise that exceeds 15 degrees Fahrenheit (-9.44 degrees Celsius) per minute unless otherwise indicated.
   1. Mounting: Adapter plate for outlet box mounting and/or Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

## 2.07 ADDRESSABLE INTERFACE DEVICE

A. General:
   1. Include address-setting means on the module.
   2. Store an internal identifying code for control panel use to identify the module type.
   3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recalland to circuit-breaker shunt trip for power shutdown.
   1. Allow the control panel to switch the relay contacts on command.
   2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:
   1. Operate notification devices.
   2. Operate solenoids for use in sprinkler service.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
   1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Obtain Shop Drawings of existing system from government as an infomation resource for producing an updated shop drawing for each floor inside the scope of work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
   1. Devices placed in service before all other trades have completed cleanup shall be replaced.
   2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
   1. Connect new equipment to existing control panel in existing part of the building.
   2. Connect new equipment to existing monitoring equipment at the supervising station.
   3. Expand, modify, and supplement existing controland monitoring equipment as necessary to extend existing controland monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1981.2 mm) above the finished floor.

D. Smoke- or Heat-Detector Spacing:
   1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
   2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
   3. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A or Annex B in NFPA 72.
   4. HVAC: Locate detectors not closer than 36 inches (914.4 mm) from air-supply diffuser or return-air opening.
   5. Lighting Fixtures: Locate detectors not closer than 12 inches (304.8 mm) from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

E. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

F. Elevator Shafts: Coordinate heat detector temperature rating and location with sprinkler rating and location.

G. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

H. Device Location-Indicating Lights: Locate in public space near the device they monitor.

**3.03 PATHWAYS**

A. Pathways shall be installed in EMT.

B. EMT shall be painted red enamel.

**3.04 CONNECTIONS**

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (914.4 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Alarm-initiating connection to elevator recall system and components.
   2. Supervisory connections at elevator shunt-trip breaker.

**3.05 IDENTIFICATION**

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Provide labels on each new fire alarm device. Match the building standard.

C. Install framed instructions in a location visible from fire-alarm control unit.

**3.06 GROUNDING**

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

## 3.07 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Visual Inspection: Conduct visual inspection prior to testing.
      a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
   2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Because there will be new devices added and some devices deleted from some of the SLC's, test the fire alarm system following any programming changes:
   1. All (100%) functions known to be affected by the programming shall be tested.
   2. 10% of initiating devices not directly affected by the change, up to a maximum of 50 devices, shall be tested.
   3. A revised record of completion (Figure 7.8.2 (a)) shall be prepared to reflect the changes. This can probably be precluded on the night by night changes that involve just programming and in lieu of that a printout of the programming changes (the new and the old programs with highlights) can be submitted with a short narrative that describes what was done. At project completion, the record of completion Form should be submitted for sure.
   4. If the system is not functional at the end of the contractor¢s shift, everything should be returned to where it was at shift beginning, keeping the old system programming on line for life safety.

G. Preliminary testing: Execute a preliminary test to verify all devices are performing as required. Document then remedy any issues and retest. Prepare test and inspection reports and submit to government.

H. GSA Fire Protection Engineer to witness a final acceptance test following preliminary testing.

## 3.08 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

**3.09 DEMONSTRATION**

A. Engage a factory-authorized service representative to train Train Owner's maintenance personnel to adjust, operate, and maintain new fire-alarm system components and interfaces.

**END OF SECTION 283111**

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# SECTION 323113 - CHAIN LINK FENCES AND GATES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Interior chain-link fences.
2. Interior swing gates.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles:

### 1.3 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates by field measurements.

## PART 2 - PRODUCTS

### 2.1 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: 10 feet.
2. Steel Wire for Fabric: Wire diameter of 0.148 inch .

   a. Mesh Size: 1 inch .
   b. Aluminum-Coated Fabric: ASTM A491, Type I, 0.40 oz./sq. ft. (122 g/sq. m).

3. Selvage: Knuckled at both selvages.

### 2.2 FENCE FRAMEWORK

A. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 or ASTM F1083 based on the following:

1. Fence Height: 120 inches .

2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40.

    a. Line Post: 2.375 inches in diameter.
    b. End, Corner, and Pull Posts: 2.875 inches in diameter.

3. Horizontal Framework Members: Intermediate and Bottom rails according to ASTM F1043.

4. Brace Rails: ASTM F1043.
5. Metallic Coating for Steel Framework:

    a. Type A: Not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating according to ASTM A123/A123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating according to ASTM A653/A653M.
    b. Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
    c. External, Type B: Zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- (0.0076-mm-) thick, zinc-pigmented coating.
    d. Type C: Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. (0.55-kg/sq. m) coating.
    e. Coatings: Any coating above.

## 2.3 TENSION WIRE

A. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire according to ASTM A817 or ASTM A824, with the following metallic coating:

    1. Type I: Aluminum coated (aluminized).

## 2.4 SWING GATES

A. General: ASTM F900 for gate posts and swing gate types.

    1. Gate Leaf Width: 36 inches each leaf.
    2. Framework Member Sizes and Strength: Based on gate fabric height of more than 72 inches.

B. Pipe and Tubing:

    1. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework.
    2. Gate Posts: Round tubular steel.
    3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Welded.

D. Hardware:

1. Hinges: 180-degree outward swing.
2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from exterior side of gate.

2.5 FITTINGS

A. Provide fittings according to ASTM F626. Provide base plate welded to posts for interior installation on concrete floor slab.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:
1. Rail Clamps: Line and corner boulevard clamps for connecting bottom rails to posts.

E. Tension Bars: Steel, length not less than 2 inches (50 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

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. Hot-Dip Galvanized Steel: 0.148-inch- (3.76-mm-) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

G. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. (366 g/sq. m) of zinc.

PART 3 - EXECUTION

3.1 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.

B. Post Setting: Secure post base plates to concrete slab with mechanical anchor bolts.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

C. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more [

D. Line Posts: Space line posts uniformly at 96 inches (2440 mm) o.c.

E. Post Bracing and Intermediate Rails: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches (1830 mm) or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (610 mm) o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along top of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches (152 mm) of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Bottom Rails: Secure to posts with fittings.

H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches (380 mm) o.c.

J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

## 3.2 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.

## 3.3 ADJUSTING

A. 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.

B. Lubricate hardware and other moving parts.

END OF SECTION 323113